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REGION IX
SAN FRANCISCO CA 94111

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"COST OF CLEANING THE ENVIRONMENT"

presented by the
United States
Environmental Protection Agency

AMBASSADOR HOTEL
Los Angeles, California

Friday, March 30, 1972

PARTICIPANTS:

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JOHN HILL	Director, Program Development Management Staff

Mr. PAUL DE FALCO: I am Paul De Falco, Jr., the Regional Administrator of the Environmental Protection Agency for Region Nine, and the Region includes California. I'd like to take this opportunity to welcome you all to this meeting. And I'd like to start the meeting off very rapidly by introducing Mr. William D. Ruckelshaus, the Administrator of the Environmental Protection Agency who will introduce the subject to you. Mr. Ruckelshaus.

MR. WILLIAM D. RUCKELSHAUS: Thank you, Paul.

Ladies and gentlemen, we are delighted that you could get an opportunity this morning to meet with us. We have here with us today representatives from our Agency here in Region Nine and also from Washington, and I think that the gentlement that you will hear from after me represent as fine a collection of economists, managers, and people who understand the full impact of the problems of the environment as are anywhere in the country.

We have been wrestling with this problem now for the last 16 months as an agency and I believe that the reports that you have been given which are the results of studies conducted by the Environmental Protection Agency and also by other Federal agencies are as good on the economics of pollution abatement as any studies that have ever been made. They're by no means perfect. There are and will continue to be problems that need analysis and that need consideration.

But I believe that this is the best start and foundation that we've ever had to discuss this extraordinarily complex problem of cleaning up the environment. And I would like to say on behalf of our National Agency that we're extremely pleased to have as a Regional Administrator someone of the capability and quality of Paul De Falco.

We have created as an agency the strongest Regional organization of any agency in Government, strong in terms of the delegation of authority and power to our Regional offices. We hope that the citizens and Governmental units located in the Regions around the country will see as their major focal point for questions, for problems, for solutions, the Regional office.

It's an experiment in Government, and it's an experiment that I think is extremely important as a concept if we're going to be ultimately successful as a pluralistic complicated society in solving some of our problems.

Never in the history of this country has any movement caught on so fast as the wave of environmentalism that has swept over our people during these last two or three years.

The average citizen -- that includes anyone who has ever breathed foul air, observed the turbid flow of our filthy rivers, or driven a car in traffic; anyone who has ever tried to find a little peace and quiet; anyone who has ever had doubts about the purity of his food and drink -- this average citizen demands action on the part of business and government to clean up the mess we have made.

And the fact is that together we have taken important initial steps and are about to do much more under the aegis of existing and proposed legislation. But just as in physics there can be no action without a reaction, so in economics there can be no benefit without a cost.

Anyone who tells the American people that we can clean this country up cheaply or that it is practical to remove every ounce of pollution from the environment is simply practicing the same old demagogy of overpromising, which guarantees underperforming and angry disappointment.

It has been my belief from the very beginning that the environmental, economic, social and aesthetic benefits of any government policy should be at least equal to its costs. We should undertake no action whose costs and benefits have not been carefully weighed and we should make every effort to predict the effects of a given policy on society as a whole.

Admittedly, we have just begun that kind of planning. We must examine the long-range consequences -- in terms of resources, employment, technology, population control, land-use and urban design -- of a gradual shift from quantity to quality as our national purpose.

So the question may be raised at this point whether our economy, oriented toward production and consumption per se, can accommodate new social requirements and do so at a reasonable cost.

At first glance, pollution control looks like a prohibitively expensive proposition. For example, in our annual EPA report to Congress on the economics of clean air we forecast expenditures of around $42 billion in the period fiscal 1973-77 just to control air pollution alone. The Council on Environmental Quality estimated that the combined cost to industry and government of air and water clean-up plus better management of solid wastes would amount to around $105 billion between 1970-75. In other words, about one percent of the cumulative gross national product in those years.

But this Administration recognized at the outset that we needed additional independent confirmation of the total dollar cost of a national effort to clean up the air and the water. Last year the Council on Environmental Quality, the Department of Commerce and the Environmental Protection Agency commissioned a task force of impartial consultants to get the answers.

The results of their computer study were released on March 13, and I think they should be reassuring to all who have wondered whether this nation can actually afford the costs of a major environmental renovation.

The panelanalyzed eleven major industry groups and found that current pollution control requirements will compell the closing of 200 to 300 plants by the end of 1976. However, none of the eleven will be hurt severely as a whole.

Most of the 12,000 plants now operating will stay in business and be profitable, except for 800 that are expected to close down due to obsolescence or other reasons not connected with the environment. Our task force estimates that the overwhelming majority of plants that will close to avoid installation of expensive pollution control equipment would fold up anyway in the period 1976-1980 because they are outmolded and unprofitable.

With regard to employment, 50,000 to 125,000 jobs may be wiped out, many of them in smaller communities where the economic impact will be substantial. However, that amounts to only one to four percent of the workers in the 11 industries -- in other terms, about 0.5% (five hundreths of one percent) of the U. S. labor force in 1970.

We in EPA are already cooperating with the Labor Department to ensure that those who lose their jobs will be retrained or relocated if they wish. Federal development loans will be offered to the communities affected.

What about other industries? Will their experience be different? We think not. The task force reached similar conclusions in a broader study of 25 industries representing 80-90% of our national factory output. Existing and anticipated pollution controls would reduce the average annual GNP about 0.6% (six tenths of one percent) between 1972 and 1980. Unemployment overall would rise one tenth of one percent, which amounts to 80 to 100,000 jobs.

However, it is possible under optional conditions that the pollution control industry will provide more jobs than are lost in premature shut-downs.

Naturally the foregoing calculations are tentative. Not all industries will be affected in the same way. The magnitude of control expenses depends to a large degree upon the nature of production technique, abatement processes, volume of pollutants, feasibility of waste by-product recovery and the size and location of a given plant.

Some companies have discovered that there is great wealth in what we throw out, burn up and pour down the drain -- possibly enough in certain cases to pay for a substantial part of conttrol equipment. The very act of redesigning factory processes to incorporate clean technology opens up opportunities for higher productivity, expanded profits, rising real wages, better products and growing tax revenues.

Dow Chemical's experience offers encouraging evidence that well-managed companies can save money right now by controlling or recovering various effluents. At Midland, Michigan the company is building 28 cooling towers at a cost of $7.2 million to reduce the thermal load on the Tittabawassee River. The towers will more than pay for themselves by reducing corrosion and cutting daily water intake by 100 million gallons.

Indeed, anti-polluion efforts at Midland have saved chemicals worth more than $6 million over the past 3 years. At Dow plant in Texas, $900,000 put into controls saves $265,000 worth of chemicals every year. Not every anti-pollution project results in net savings, but in a highly-competitive industry, Dow's profit margin of 24.5 percent is well above the industry average of 18.7 percent.

It should be noted that companies which find the initial control expenditures too burdensome can often finance their equipment with tax-exempt industrial development revenue bonds.

Finally, in calculating outlays we must not overlook the social and personal savings that will accrue once our air and water are reasonably pure. Air contamination alone may cost this country $16 billion a year in damages to human health, materials, crops and urban vegetation and may rise to $25 billion per annum by 1977. These figures are only approximate. But the AMA estimates that disease induced by the environment as a whole costs $38 billion each year.

The overwhelming majority of the American people, as attested by the pools, believes that a cleaner environment is worth a little inconvenience and temporary expense. I'll admit this sentiment has not really been put to the test. We haven't held the ultimate consumer's feet to the fire long enough. But EPA is betting that the new public awareness is not for sale.

I think the average man and woman will look forward to a world free of smog, roadside litter, and putrid waterways, a world liberated from noise, ugliness, stench and urban decay. And that expectation ought to become outright enthusiasm when they realize that the cash savings alone may total $200 per year family by 1980.

Considering the total evidence, therefore, I think all this talk about environmentalism ruining the economy is just nonsense. We are going to get back much more than we pay out. Far from retarding progress an ecological sensibility, carried to its logical conclusion, will guarantee the good life indefinitely.

However, to ensure such a prospect we must conserve and recycle our resources. The average lifetime of industrial and private capital must increase, that is we must get more for our money -- our machine tools, cars and appliances should last longer and be cheaper to repair.

Higher priority must be assigned to social equality, because discrimination and inequality are wasteful as well as immoral. Services like education, health care and creative leisure must be esteemed more than speed, glitter and gadgetry. Population growth, as the President's commission found, must stop and the sooner the better.

This is not to denigrate our achievements as a nation. Indeed, our very success compels us to drop those prodigal habits which alone can threaten what we have accomplished here. We must learn to manage the earth as one cultural and biological system.

If we boldly grasp this historic opportunity, peace and prosperity and social justice will be ours. Once restored to harmony with the natural world that gave him birth, man will be free to develop his highest intellectual, spiritual and aesthetic potentials. Our environmental investments -- generously committed -- will ensure a timely transition to a new epoch in the history of the human race.

MR. DE FALCO: Thank you, Bill.

If we can, I'd like to introduce Mr. Tom Carroll, our Assistant Administrator for Planning and Management, to discuss with you the details of the Federal Environmental Protection Program and its relationship to the Private Sector.

But before I have Tom come to the mike, I'd like to raise the item of mechanics of the meeting. Since we're going to be going into rather detailed statements, figures and what have you, and questions have more substance if they relate to the specifics, we're going to have three young ladies from my staff walk the aisles with 3 by 5 cards. As you hear something you desire to raise a question on, would you please signal for a card, make your question known on the card, and pass it up through the young lady to the table here. And at the end of the presentation, in each case, we'll have whoever is handling that material review those questions and try to answer them.

Tom.

MR. THOMAS E. CARROLL: When we started this agency a year ago, we knew what we wanted to do, but we just didn't know where to start. Well, we've been taking great strides during the past year. Today, in discussing with you some of the conclusions that we have reached, which will indicate some of the new directions we might take, that the condition of the issues will be tested against your questions. If we're wrong, we'll be ready to admit it. We want this to be a cooperative session. We hope that you will give us your very best expertise and help us come together in solving these problems.

Before I get into the subject of my talk, I'd like to place two historical things in perspectives that I think are necessary for the context of what we're going to deal with today. We're dealing with something that is unique as an issue, as you all know, and as Bill indicated.

The environmental awareness is a rather recent phenomenon. The Federal Government took an approach to establishing EPA. This was unique. It is the only Agency in the Federal establishment which is at once regulatory. It is non-adjudicatory. It is independent. It does not sponsor a development, any mission, or product.

Given that uniqueness of the issue and of the entity with which we are dealing, we spent much time in our first year structuring EPA internally. Our three guiding precepts are also unique and different from those of the Federal Government. Firstly, there is a very strong localization or regionalization of the Agency. Bill has already indicated this to you.

Secondly, we are a highly functionalized Agency. Indeed, that is one of the reasons why EPA was formed. We do want to integrate the problem-solving techniques of voters and skills in the areas of air, water, pesticides, and the like.

Thirdly, we have been most concerned with the balance of our decision-making process. When EPA was formed in December of 1970, we were faced three weeks later with the Clean Air Act Amendments of 1970, which placed a variety of very stringent timetable deadlines on us to issue legislative regulations.

There were many who said that we were just a bunch of ego freaks in Washington having fun issuing this regulation and that regulation. With hindsight, we did have to make a few intelligent guesses. At the same time we were attempting to organize and structure EPA so that as we grew and as we matured, we would achieve balance in our decision process.

This is best exemplified in the way we now approach regulations. They are sponsored by the Program Office. They are independently appraised by our scientific personnel who tell us whether there is scientific validity for the problem that we are trying to solve. Whether technology to solve that problem is available. We make independent appraisals to determine whether the approach taken is enforceable. Whether it is within our legislative mandate. Also, we have independent appraisals of the cost impact on the regulated as well as studies to determine whether we're taking the most cost effective strategy to achieve the desired goal.

Now, I mention this because we would like to extend this structuring in the balancing of problem-solving within EPA to all those concerned with the environmental movement.

We feel that we have had very good relations with the State and local Public Sector as well as with the public interest groups, and the conservation and environmental organizations. One of the reasons that we are holding a series of meetings like this around the country is because we feel it is time for us to establish a better rapport with the other side of those involved with this problem so that we can maintain balance in our decision processes. That brings us to the role of industry.

In the past year, it has been very apparent that industry has been quite reticent to deal with the Federal Government, and I well understand that having been on the other side of the fence during my entire business career. There is always some bureaucrat who will say, "Well, just give me your figures today and I will go in with them." but he'll be replaced a year from now and they're come back to haunt you.

I think it's important for industry to recognize that EPA sets its standards based, in the case of primary standards, purely and solely on health effects.

Secondly, the secondary standards are based on environmental effects. Now, this is a little different from dealing with the SEC, the FTC or the FCC, because we take cost and technological problems into consideration in adopting the most cost effective strategy to meet that primary health or that secondary environmental standard.

Traditionally, industry has dealth with this issue through the Department of Commerce and the National Industrial Pollution Control Commission. Our relationship with them have been very good. They have aided us in calculating some of the figures that we're going to talk about today, but we would encourage you to help us with your figures.

Secondly, over the past year we have seen evidence in the changing of the attitudes of business towards the theory of pollution. There has been a reappraisal of the theory of process control in their operations where they no longer can consider the air and the water as free inputs to their manufacturing process or free, at least, as disposal outlets. Bill talked about one example, which was Dow Jones (Dow Chemical). We have other examples such as Johns Manville. Dow Jones (Chemical) is a service industry, which I'll discuss later.

But we are encouraged by this rethinking in a positive attitude on the part of industry. We think that we see industry starting to think in terms of pricing their product fully -- what my economist associates call the "internalization of the costs of pollution control." We feel that this marketplace determinator of costs is much better than anything we can impose, or do, form the Federal level or, indeed, the State and local level. And finally, we talk about the industrial or manufacturing companies who are the polluters and who are the ones who must deal with the problems.

It has become very apparent to me in the last four to six weeks that it is a service organization principally, locally -- your media; radio, television, newspaper; it is your banks. And those who have a general concern in the well-being of a community in which they live, who, because they are local and service oriented, cannot move a plant across country or across the state border -- these are the organizations who must be concerned with the quality of life in that community.

It is these organizations that we would hope would take a leadership role in their communities to help solve the control problems. I mention particularly banks because we have seen some examples of two or three industries or cities, river basins, where banks have taken a role to try to involve all the industries in that community to keep them aware of what must be done to make that community a good place to live and to work.

Now, I wish finally to come to the study that we're going to be talking about today. There have been during the course of the past year four studies, one of which Bill mentioned, which was jointly undertaken by the Council of Environmental Quality, the Commerce Department, EPA, and the Council of Economic Advisors. There have been three others that we have undertaken within EPA in the air, water and solid waste areas.

We're going to discuss each of those four with you in detail in the course of the day, but before we do, I just want to give you some background of an oversight.

What these studies collectively have shown us is that the dollars, as Bill indicated again, are large. They are much larger than anybody thought they were going to be a year ago. Of course, new legislation is the prime reason. The cost dollars are large.

Even more surprising perhaps is the ability, however, of industry to absorb these large amounts of money. You combine that with the fact that we have discovered, even though we're in the very early stages of this sort of analysis, that the benefits to be achieved to society from this sort of cleanup exceed the costs of the cleanup. Not only on a current basis, but over a period of four or five years here, we are trying to clean up and turn around the wastage and the damage of years and years, and hopefully, even change a societal epic or a way of problem solving; whereas those costs are one-shot, the benefits will be permanent and enduring.

The studies also show that in the industries whose studies we selected since they were the ones with the most impact on the pollution problems, the ones which were also the most cost affected by the types of control necessary to solve their problems, have, as individual industries, a capability to finance these added costs, if they are added into the line costs, and they aren't purely process controlled internally which may improve their efficiency.

Having demonstrated that we will not impact the profits in a major way of these industries, this obviously improves the opportunities for private financing.

Now, underlying these reports is the assumption, which, I think Bill also alluded to, that this concern for environmental quality is not a passing fad. That in many cases, Americans feel a better life is worth a short-term cost - the trouble it takes to clean up the environment. But we have not yet tested this in the marketplace. That moment of truth is yet to come.

We feel (we're optimistic) it will come in a genuine way and the American public will accept it.

But, granting that we can no longer freeload on the environment, can American industry itself meet pollution control requirements without inflation, without unemployment, or triple international trade? The responsibility of the Federal Government to protect the environment, to abate various forms of pollution is written in the law.

These deadlines -- these types of pollutants to be controlled are mandated. Projections of what this is going to cost to the Nation have been made by others. We feel that the figures that we're going to give you today are the definitive works that's been done to date on a broad basis in this field. To understand the figures, we must understand the ground rules for these projections. The first and the most important rule we must set is simply: What do we mean by economic impact?

By our definition -- and we picked the broadest that we could -- it is the sum and total of all of the changes in the Nation that occurs as a result of pollution control. It includes any change in the rate of growth of the gross national product, inflation, unemployment, interest rates, our position in international trade. It includes such private items as personal income, per capita consumption, personal investment, and the like. It means price increases, plant shutdown, shifts in employment, and the repercussions of economic change in individual communities.

One caveat, however: keep in mind that national income accounting, like private industrial accounting, does not reflect quality of life types of items. When you go to a hospital because of a respiratory ailment some smoggy day in Los Angeles, that increases the gross national product left by it just increases the revenue of the hospital, and those gross national income figures do not, are not netted down from your loss of wages or your time off the job.

Economics aside, the name of the game is environmental cleanup, not the maintenance of the status quo. In many cases, pollution is already costing society more than the cost to install and maintain the controls. Certainly, this is true of the case of air pollution. It may be true of other forms of pollution, and we don't as yet have definitive data.

I am not suggesting that society will make these necessary changes smoothly. There will be rough spots. There have been rough spots. We do expect as a response to these changes wrought by environmental controls that the vast majority of Americans will call into play the individual and corporate resiliency which has contributed so much to making us both individually, and collectively, a nation of leaders in so many fields.

Society cannot achieve the benefits of a cleaner environment without economic impact. But it is vitally important that we understand the significance of that impact.

Therefore, the second ground rule on which to base our discussion is: through what framework do we discuss the impact? The changes that result from pollution controls go beyond mere costs. The cash flow problems can be serious. Financial institutions will, in some cases, be unable to finance the investment needed for control equipment. There may be return on investment problems and opportunities. Installed controls offer benefits to society, but frequently they offer no increase in productivity. On the other hand, control measures may require more streamlined operations, and to this extent, both productivity and return on investment will be improved.

A case in point, not because of environmental considerations, but the gradual evolution and change in the steel industry from open hearth furnaces to basic oxygen furnaces, is one which has not only made the industry more efficient, but certainly served to clean up the environment and minimize our problems and concerns with that industry.

The consequences of price increases are often widespread, causing repercussions in many segments of society. Plant shutdowns represent very real problems to people out of work, and on a large enough scale, very serious problems to other secondary industries.

A complex problem to be faced is what can be done when entire communities are upset through plant closing or high unemployment. And, in what is probably the most complex problem of all, cleanup costs may aggravate our balance of payments position.

Now that the Federal Government has formed a framework through which the economic impact of pollution control can be arrested, what are the results?

As Bill indicated, in the larger studies, the inter-agency study, we tried to quantify the problems through the macro of economics, and the 11 micro economic studies, the projected control cost to the Nation through 1972 - 1976. Our focus in this study was water pollution abatement costs, air pollution abatement costs, and the years in which the costs will be absored. We have assumed that all costs will be incurred by the year 1976, when the current for both air and water take full effect. Water costs will be absorbed in equal increments over the five-year period, but about 75 percent of the air costs will be absorbed in the two-year period 1974 and 1975.

The important note here is that EPA estimates that the 1976 standard, or best practicable technology, specified in the current draft of the Water Bill, in both Senate and House versions, is essentially the same as the equivalent of secondary treatment assumed in our figures when these studies were undertaken almost a year ago.

Hence, the effect of the current draft of the Water Bill, and the one reported out of the House, if it is passed, on these findings, would be nil as far as the Industrial Sector is concerned between now and 1976. After that date, the impact will be significant when the bill requires higher standards than best practicable technology.

A second important note is that not all abatement costs are included in our projections. Only those associated with Federal standards. If localities implement stricter standards, State or local, abatement costs will be higher.

Also, while some solid waste costs were included in the projections we're discussing today, in all likelihood they are underestimated because at the moment there are no Federal standards on solid wastes. In other words, the national cost of controlling trash and garbage on the local level are not included in our figures. Certainly, a very significant item.

This study shows that the Nation will not suffer major dislocations as a result of pollution control in the sense of causing a recession or doubling the rate of inflation, but we do expect these six changes to occur during the '72 - '76 interval.

The Consumer Price Index is likely to rise at an annual rate of .3 to .5 percent. Employment declines result in an increase of .1 to .2 percent in the aggregate unemployment rate. The rate of growth of the gross national product will fall marginally during 1972 to 1976 from 5.2 percent to somewhere between 4.7 and 4.9 percent. Impact on selected industry profitability will vary, but generally is not severe enough to discourage private financing.

Per capita consumption will fall in this period from 5.3 percent to a range between 5.0 and 5.1 percent. The most serious identified consequence of pollution control expenditures may be in the area of international trade with an average annual decline in the current account balance exceeding 1.9 billion dollars per year. This assumes that no pollution control costs will be incurred in any foreign country between now and 1980, which is a conservative assumption that we took, and, obviously, if equivalent costs are incurred in other countries, this deficit will be reduced accordingly.

These points are the substance of the economic impact that this Nation will experience during the next several years. They and the underlying details are covered in the grey booklet which we handed out to you. Bob Sansom is going to discuss the individual industry studies with you next on this panel.

Turning now to air in the first of the three EPA studies, we calculate a total private outlay of 42 billion dollars will be needed during fiscal years '73 - '77 to implement necessary controls for mobile and stationary sources of air pollution. The estimate for mobile source control is 24.7 billion dollars and takes into account the stringent emission standards mandated by the Clean Air Act of 1970.

The estimate for stationary source controls is 17.2 billion dollars and reflects the national air quality standards set by EPA in accordance with that Act in April of last year.

Both of these figures are much higher than a year ago, as I indicated. As a result of a change of the Act in the case of the stationary source control, we are now covering all 248 Air Quality Control Regions the prior laws had not covered so broadly on a national scale.

The costs calculated for mobile source include controls on three pollutants -- carbon monoxide, hydrocarbons and nitrogen oxide. For stationary sources, five pollutants are covered -- particulat matter, sulphur oxides, carbon monoxide, hydrocarbon, and nitrogen oxide. We based our projections on three categories of stationary sources -- solid waste disposal, which includes open burning and incineration; fuel combustion, which includes heating and power generation; and 17 types of industrial processes.

The most strinking feature is the cost benefit data. The direct cost of human mortality and morbidity are in the neighborhood of 9.3 billion dollars annually. Damage to property values ranks about 8 billion dollars annually. And damage to materials and vegetation amounts to about 7.6 billion a year, a total annual damage cost of about 45 (sic) billion dollars.

Not included in this figure are such things as noise damage costs from those reduction of property values along highways and airports; health costs ascribable to carbon monoxide, hydrocarbons and nitrogen oxide and photochemical oxygen because virtually, a complete lack of data is available to us.

Also not included are the costs of air pollution effects on commercial and cultural property, esthetic visibility and soiling, so the 25 (sic) billion dollar a year figure that we are using is highly conservative.

It is also significant in terms of this benefit cost ratio, to keep in mind that whereas the highest costs are in the mobile source area, the 24.7 billion dollar figure, the pollutants caused by automobiles -- carbon monoxide, hydrocarbons and nitrogen oxide, are the very ones for which we have no data in our damage cost figures.

Projections of the cost to reduce air pollution damage come to about half of these damage costs when we annualize our figures in 1977. The result is a 12.3 billion dollar annual cost figure in 1977 for emission control that will generate 14.2 billion dollars worth of benefits. A cost benefit ratio of better than one to one. And our evaluations as to exactly what air pollution is costing us in damages, still leaves many unstudied.

Now, let us turn to water pollution control costs. The Executive Branch has reported to Congress, and just about everybody else, on the cost to abate water pollution for the last five years, a period in which the condition of the Nation's water bodies have grown progressively worse. However, our indexes show that we just about held our own in 1971 over 1970 without playing the economics game that one little figure means a trend. We are hopeful that in a year where we had growth in the economy and growth in population, the fact that our measures held about constant, is a good omen.

The tools used to measure these costs and the facts have been very imprecise. To develop greater precision in assessing the costs is so complex and extensive a problem, we have devised a new method of evaluation -- what we call a pollution index. This particular technique enables us to gauge the utility of past abatement efforts by determining the degree to which the Nation's waters deviate from established standards.

Historically, this is only a measure of numerical mileage counting, and we are now in the process of attempting to improve the index by adding duration and intensity factors. We have only one year's experience with this, therefore, we cannot yet be comparative. We are hopeful that we will be able to be comparative and use this index a year from now.

The need for investment in the treatment of manufacturers' waste between 1968 -- in the case of water, we have to go back a little bit for our base year -- and 1976 is calculated at about 10.2 billion dollars, and there is no question that to us such a schedule will be very difficult to achieve. Why do I say that?

Here are some of the critical problems: Manufacturers are responding to waste treatment requirements at the same time the Public Sector is increasing its capitalization of waste treatment works. Total sewage starts had not reached one billion dollars by 1967, but in 1971 manufacturers and municipalities, together, initiated about two and a half billion dollars worth of sewage and waste treatment contracts. This increase in both Private and Public Sectors has presented the economy with some very sticky problems -- higher construction costs, 14 percent last year in the municipal sector; lengthened construction schedules; delayed deliveries; and greater demand on the supply of suitable construction services.

Expansion of the level of investment will be necessary in the future. Growth and replacement demands account for more than half of the needed capital requirement through 1976, and their level is in large measure determined by the dimensions of the capital base of it.

A slower rate of economic growth would permit the attainment of tolerance with a lower rate of increase, but internal growth of a specific industry or system has greater influence on annual level of investment than the external imposition of treatment requirements.

In summary then, over the next five years the Nation will experience somewhere over 50,000 and 135,000 direct job losses, and if as many as two other jobs could be lost from a secondary ripple effect for each one person directly unemployed, the average annual unemployment might be 50,000 persons, or slightly under a tenth of a percent of the 1970 labor force. To alleviate the problem of displaced workers, the Department of Labor has a number of programs that can meet the requirements of the unemployed. EPA and the Department of Labor have entered into an early warning system in which we intend to notify industries and/or communities that may be affected by job losses. Also State employment services provide for relocation allowances or public service employment.

From 70 to 120 communities in the Nation may also be severely affected. Generally, these will be smaller communities and generally they are one industry towns.

Bill indicated to you earlier the number of firms that will be closed due to pollution control damages -- the cost of pollution control equipment -- over the next five years, and it's interesting to note in passing that only two Amendments were added to the reported version of the Water Bill that was voted on by the House. One of these two Amendments was a requirement with regard to plant closing attributed by the mangement or labor unions involved to environmental concerns, EPA will hold public hearings to determine if, in fact, that was the reason for the closing.

I think you all are well aware that in many cases environment is blamed for some actions which, on closer examination of the fact, turn out not to have been the case. The fact usually turns out to be that it was a marginal plant to start with; that the sources of raw material have changed; that the market has moved on; and the product has become obsolete in the life.

Basically, there are two categories of these firms which were closed. Those for which pollution abatement costs will eliminate profit margins. Most of these plants are marginal now. Abatement costs will merely accelerate closings that would have occurred anyway. And in these cases, the Federal Government will not perpetuate failing firms.

The second category is those plants which could remain somewhat profitable after absorbing abatement costs, but they cannot finance the necessary investment or they lack the technical know-how to engineer cost effective abatement techniques. These firms, because they have a long-run viability, will be helped.

Here is a sample of some ways in which they might be helped. EPA construction grants for municipal treatment plants will assist those firms which hook up to municipal disposal systems by providing financial assistance. Such arrangements, even when they provide for user charges to recover costs, afford the firms economies a scale for municipal interest rates, thereby reducing capital and operating costs. The accelerated depreciation provisions of the Tax Report Act of 1969 subsidizes plants that make a profit by reducing the effective capital costs on air, water, pollution abatement equipment.

Industrial development bonds -- a very exciting development -- likewise subsidized firms by eliminating the initial capital requirements and providing for lease payments based on a lower municipal bond rate. This form of aid is one which I think is very pertinent to the comment I made earlier about the service industry's support in a community. The media or the banks, if they can help get industrial bonds through, can get them voted in a community; they can help through this medium to improve the industry that's in their own home town.

Similarly, the loans and the loan guarantees made by the Small Business Administration and the Economic Devleopment Administration provides financing at the low market interest rates for pollution abatement equipment to those firms that qualify.

Faced with these problems, how do we allocate the costs that are incurred by the Nation over the long term? Obviously, to date the Nation has not done well at this.

It is in the process of restructuring elements of the economy to meet the new demands of environmental controls. The process is continuing. The Federal Government can make some changes directly. A recent example is the first proposed tax on pollution -- the sulphur oxides tax that was sent to the Congress this year. This is an example of an alternate incentive strategy, one that obviously must be coupled to reduction in the tax if it is to be a success in the abatement program, but in order of strategy to the current regulation and then lawsuit on top of that approach which is being taken today.

We can sponsor at the Federal level a development of technology. For example, to convert solid waste to fuel, sulphur oxide control, advances automotive power systems, EPA is undertaking, as well as other Federal agencies, the Bureau of Mines, and Interior, AEC and the like, a variety of this technological research.

We can restructure the depletion allowance to include secondary materials in competition with virgin materials. We could end discriminatory freight charge. Until now then, having not priced the environment at its full value to society, we have not put a high enough value on pollution-free surroundings.

Now, we are at the point in our environmental revolution where traditional measurements are inadequate. We face tough problems ahead. The demand is for leadership.

I submit that it is time for the business community and the industrial community to take this leadership role in a balanced, considered and meaningful approach to environmental cleanup.

In the long run, an improved quality of life is good for all citizens, corporate and private.

We enlist your aid, and I thank you.

MR. CARROLL: (in question and answer session)

Q. Referring to the Georgetown University Report on five well known bottling companies having water samples showing the bacteria and viruses in the Potomac River -- reading this report, the Supreme Court stopped using bottled water. Does the EPA intend to submit tests on all bottled water, insist on some sort of regulatory policy which will protect users? Assurance of clean drinking water. Will there be distillation plants implemented as this is the only method of obtaining pure water? Will water in municipal plants have upgraded methods?

A. Bottled water is essentially a province of the Food and Drug Administration. We are obviously concerned in our water hiking programs about the quality of municipal water supply. There is a bill in the House to set guidelines and standards. We feel that that is essentially a local problem and the role of the Federal Government is to merely backstop through technical expertise and technical assistance the local programs.

Q. Will the cost for cleaning the environment, given in Bill Ruckelshaus' statement, be in agreement with the recent Administration reports on the costs of a clean environment? I assume that the recent Administration reports are probably the so-call Recap Reports which came out of the Office of Science and Technology, again a study in which EPA participated, that was primarily directed at mobile source pollution control, and I think it also included safety factors for automobiles, didn't it?

A. On the cost to society of pollution control devices on automobiles, yes, EPA is in agreement, certainly, with that report. Some of the variations we naturally will hear a little bit more from Elli Burton later when he talks about air.

Q. Let's ask how EPA decides what an impartial consultant is?

A. I guess you're looking at them up here right now.

Q. How can EPA really be effective if it has no control over resource exploitation?

A. That's an excellent question, and I think that's really one of the virtues that we have. EPA does not have the conflict of interest which historically existed in the Department of Interior, for one example, or the AEC, for another example, where they were trying to protect society generally and, at the same time, trying to develop a specific and limited resource.

It is primarily through the Environmental Impact Statement comments under the National Environmental Policy Act of 1970 that we do impact the other agencies. We do not have any legal authority over their activities, but we certainly have a great opportunity for publicity. The ultimate decision must be made by those resource agencies. But, under the law of that Act, they must consult with us, among others, and the general public. They must hold public hearings. And I think it's that publicity which is the most effective route that we have for control.

Q. Does the Regional Administrator have control over research and development funds? If not, why not?

A. He does not, and the answer is that we thought that research was the prime area where we could get the sort of integration that EPA was formed to meet, the expertise required to solve pesticide problems in determining tolerance petitions or registrations -- to appraise registration requests, is much the same as you're doing when you're analyzing how those pesticides flow through water or through air, either of those two media, and the research people were trying to give an opportunity to take a total look at the environment, where those pollutants come from, how they flow through the environment, and where they go.

If we were to do this at the regional level, it will be very difficult for us to integrate a conservative approach of study of the environment as a whole, and that is probably the most centralized activity that we have.

Q. Mr. Ruckelshaus mentioned setting standards and enforcing them. Has EPA enforced by penalizing any polluter? If so, what was the penalty?

A. Well, as I indicated earlier, EPA is non-adjudicatory. We can request the Department of Justice to bring an action, and it's the courts who determine the penalties. I think we have filed something like - requested 233 enforcement actions in the 15 months of EPA's life. Generally, we take the approach that we prefer a civil action to a criminal action. There are some who disagree with this. But our feeling is that a criminal action is really punitive, and our goal to clean up the water and enter a civil action if we can get a remedy in equity, the ultimate goal will be better achieved, which is a cleanup abatement schedule of some kind.

Q. Are there any environmental descriptives for measuring intangible, unquantifiable values in impacts that are not susceptible to cost measurements in dollars alone? For example, time, social conflict, political impacts, esthetic choice.

A. These really aren't. Time is the interesting one, because when EPA started these micro and macro economic studies, we tried to look at two other things. What is the cost of delay on society by going through the court holdups and the Environmental Policy Act requirements? There are those who were saying even within the Administration that the environmentalists were doing damage to the opportunity for industrial growth by holding up such things as the Alaska Pipeline and the Florida Barge Canal and power plants and the like. We found there was just no way that we could quantify that time delay factor. I think the problem was mainly that it's such a localized condition that you have to just measure one zoning situation, one power plant sitting situation. And there's no way we could accumulate all these factors at any national level.

I think some of that, as we go into 1972, and expand on our studies, as we regionalize them and try to determine in each of our regions where we will have economists coming on board, what the effects are there, we can get a little closer to that sort of a question.

The other question that we tried to grapple with was the one, from a quantifying standpoint, of productivity. Are pollution controls productive assets or not? The extent that you put a control technology device on the end of a manufacturing process, it obviously does not increase productivity.

As I indicated, if you change that process earlier in the stream, it may improve productivity. An argument can be made to the extent that we are forcing an accelerated closedown of old and outmoded plants, and forcing those products to be manufactured in more efficient plants; we may be on a large scale increasing society's productivity, or industry's productivity. We could not qualify that either.

Social conflict, political impact and esthetic choice are even harder yet. We have looked at those, we've talked about them, and we just simply don't know how to measure them in dollars alone.

Q. Can someone explain the reason for the difference of almost three billion dollars in accumulative '72 - '76 investment estimated for the electric power industry between the EPA '72 report and the micro economic study?

A. Bob, you're going to cover electric power, aren't you?

Q. Industrial revenue bonds. Did you suggest that these would be Federally guaranteed?

A. No, I did not. The public obviously can't have a completely clean environment and continued economic growth. The cleanup will have an impact on growth.

Q. How does EPA determine where the cleanup is sufficient and that the public will accept the associated retardation in growth?

A. I think that's really apples and oranges a little bit, but it represents the sort of real problem that we must deal with; where we're measuring and whether the cleanup is sufficient. We're measuring health impact from a primary standpoint, and we're measuring environmental impact from a secondary standpoint. That does not relate to cost per se.

Yes, there are some pieces of the Act - various pieces of legislation - where we do have to take account of economic impact in setting standards. The Noise Bill that we proposed is one example. We are hopeful the public works at the associated retardation and growth, because we don't see that there is going to be any measure of retardation. It is important to remember in all the projections that we're giving you today, you tend to take today's costs and literally project them because that's what you know. When you get into mass production techniques, when you have four to five years to change the technology and improve the processes, it is historically true that those costs tend to be reduced.

On the benefit side, there is so little there that we feel very weak and very conservative. We think that the more research we do on this field, the minimal impact we're going to find even compared to the data that we're giving you today.

Q. Please elaborate on the benefits of Federal assistance on waste treatment to industries. We're under the impression that industry must pay its own way.

A. That's exactly true by user charges, but when an industrial plant can hoop up to a municipal system even contracting to pay user fees over 10 to 20 years, they are avoiding the initial capital requirement which that firm would otherwise have to finance its own treatment facilities and they are getting the advantage of the lower Federal rate -- the lower public bond interest rate.

Q. Why did you slough off the question about partial consultants?

A. Unless EPA can assure that the consultants are impartial, why should this or any other audience believe your figures?

Q. How did we select the consultants.

A. We have to talk about what kind of consultants. If you're talking about the consultant that did the micro studies, they were selected by an inter-agency panel made up of membership from the Department of Commerce, the Council on Environmental Quality, the Council of Economic Advisors and EPA. And, while you can't please everyone, the prime criterion here in selecting these people was that they had to have experience in the industry. We had to do these studies on a very short fuse. They were done within about 90 days. And the Department of Commerce, which we think does have some appreciation of what the industry thinks, had in effect a veto power over the consultants selected.

I think there will be people who aren't pleased with all the consultants. But I think on balance, if you look at A. D. Little, Booz-Allen, Charles River Associates; Chase Econometrics, the people who did the studies, you would be hard put to find a more reputable and competent group than those selected.

But in some cases, and I'll discuss this later, we will be extending studies because the studies didn't precisely hone in on key problems, nonferous metals is an example, steel is another example, and petroleum is a third example.

MR. DE FALCO: There's also, Bob, a list of the consultants that were used in these studies in that handout that we gave you so that you know who they are.

MR. CARROLL: I guess I was reading that question a little more broadly. I was thinking about scientific consultants too. That's an even more difficult field. On many of these questions you can find as many different answers as you can find academic science types.

Clearly, that is a continuing problem. One other way that we can find out if these people are impartial is by trying to open ourselves up to audiences like this and other agencies in town. Let's see if anybody can come up and show us where we're wrong. If that can be done specifically, we'd welcome it and we'd be the first to admit it.

Q. What is the estimated percent caused contribution of industry to total pollution? To what extent, if any, will public caused pollution be controlled?

A. This is a question I have some trouble with. I think the first part of that question is referring to where does pollution come from. There are different percentage ratios depending on what pollutant you're talking about in the sense we talked about in the stationary source of air that's free from automobiles. I think when we come to air, Elli is going to refer to that a little bit this afternoon. If there is some specific pollutant that that question refers to, come up later and I'll give you a figure.

Q. To what extent, if any, will public caused pollution be controlled?

A. That refers to the Federal level. I think the figure is about $500 million dollars in this Fiscal Year's budget for Federal facilities to be cleaned up. This is mainly plants and installations of the Federal Government. It does not include such things as the cost to the Navy if, and when, we impose our vessel waste treatment regulations, for example.

Q. Your statement that 75 percent of the cost of air cleanup will be accomplished by '74 - '75 -- it is possible to achieve this in the way of adequate hardware supply or capacity, engineering capacity and construction time? This would appear to be a very short time for implementation.

A. I believe that figure is a little misleading in a way because almost all of that is the automotive that hits you in the middle of '74, doesn't it, Elli?

MR. ELLISON BURTON: 25 billion.

MR. CARROLL: The 25 billion, that's 50 percent of the total pollution cost, and almost all of that automobile does come in '74 and '75. Lead time is a very significant problem for automobiles, obviously. Our automobile extension request hearing open on April 10th in Washington. The ability of industry, even if it has the devices to meet the deadlines by 1975 because of the estimated 30 to 36 months manufacturing lead time, will be the subject of those hearings. And one of the major subjects of those hearings.

MR. BURTON: Tom. The major crunch comes in '75, '76 for the automobile.

MR. CARROLL: Well, then you'll have to figure out between now and when you're on this afternoon where the 75 percent comes from.

Q. Should U.S. industries and foreign nations be required to meet U.S. environmental standards, which are probably stricter than those of the foreign nations involved?

A. The answer is clearly, "no," although we're certainly trying to encourage them to undertake this sort of activity through the Stockholm Conference of next June.

Q. If EPA regulations will cause several industries to close, can't the Federal Government give them long-range loans to subsidize new equipment?

A. I have indicated it depends on whether that business itself is a viable business. We don't want to keep a marginal business alive which would otherwise close just because we happen to be the straw that broke the carmel's back.

But there are areas where this has been proposed in the Administration. We have seriously considered the question of long-term loans with some sort of Federal guarantee question. We have ruled it out, for now, on the basis that the impact is not that large and the alternate sources of accomplishing that objective through the Private Sector and public bond financing have not been fully utilized.

Q. What alternate solutions were considered before Standards was adopted as a method of pollution control? Standards as opposed to what?

MR. CARROLL: The Clean Air Act of 1970 said that we must adopt Standards to protect the public health the six Ambient Air Quality Standards that they put out in April of 1971.

There has to be some bench-mark against which to measure the problem. I think there are different incentives in how to achieve that Standard. But the Standard itself is no more than a qualification and measurement of the problem.

MR. SANSOM: Tom, in the water area, there were public health standards that were promulgated at the turn of the century that did offer an incentive to construct many facilities in the water sector construction of pollution control equipment. In water this is not a recent phenomenon. It does date back to the turn of the century.

MR. CARROLL: Does the macro study include cost benefits of agricultural waste control.

I think it does not, is that correct, Bob?

MR. SANSOM: Correct.

MR. CARROLL: How would you propose to handle agricultural water pollution? Are loans and grants in order?

We don't yet know really what the agricultural problem is. It's easily identifiable in the case of feed lots which have sole point source emissions. We are trying to study things now, such as the problem of pesticides agricultural run-off -- one of the alternative methods of controlling it -- and we're trying to solve that problem. Until we know what the control requirements are, it's premature, at this date, I think, to finance something that we don't know what it is.

Q. With industrial bonds coming under the umbrella of taxes, exemptions -- what will the effect be upon the market for municipal bonds? And how will the Treasury Department look at industrial bonds?

A. We have not yet been able to resolve that problem. The industrial bond device is being used, because it tends to come at the local level, but we found no place where any data is collected. It's a rather recent phenomenon in terms of its growth. We have checked out several estimates that one tends to read and ban, so the Private Sector is reporting in industrial journals, and we have found when we have tried to trace all their reports down that their data was even as iffy as ours. The reports only gave someone's back-of-the-hand estimate.

We have talked to the Treasury Department. We are trying to get a handle on this. When we find out how large it is, we will then be able to talk to Treasury as to what kind of an impact it will have. I think we still feel in terms of the huge magnitude of municipal bonds in this country that this increment on top of what has already been issued has no price interest rate impact to date.

MR. SANSOM: Tom, we might give them the one estimate that was put together by a Boston bank was last year, I think, was 65 million and this year, 500 million and projected in '73 to 2 billion. But that's just somebody's guesstimate, and is someone who has a vested interest in selling the bonds.

MR. CARROLL: Since one of the goals is for us to become better acquainted with EPA leadership, I will give a brief background on each speaker.

I have the pleasure of introducing your next speaker. Dr. Robert Sansom.

Bob is currently Deputy Assistant Administrator for Planning and Evaluation of EPA. This is one of the offices in my Planning and Management Shop. Bob graduated from the Air Force Academy in 1964 first in his class. From Georgetown University in 1965, he received his Master's in Economics.

He was a Fullbright Fellow to Argentina in 1965. From 1965 to 1968, he was a Rhodes Scholar to Oxford University where he received his Bachelor of Philosophy in 1966, and a Doctor of Philosophy (Economics) in 1968. After all that education, Bob became a White House Fellow, was assigned to Assistant to the President for National Security Affairs in 1968. In 1969, he became a member of the National Security Council Program Analysis Staff, and he joined us in October of last year.

And, I want you to know how we find highly qualified people: Bob did a publication called "The Motor Pump: A Subsistance Investment."

And if that doesn't equip him to talk about the environment, I don't know what does.

MR. ROBERT SANSOM: Thank you, Tom.

I think you probably heard George Bernard Shaw's verdict on economists. He said if you lay all the economists end to end, they'd never reach a conclusion. And I think from what Mr. Ruckelshaus and Mr. Carroll said today, we have reached a few conclusions, albeit they are tentative.

My remarks will be addressed to two points: First, how did we obtain the industry impact results Mr. Ruckelshaus and Mr. Carroll have summarized for you today. That is, what happens to industries to produce the plant closures, unemployment, and so on we project? In addressing this point I will highlight some of the results we expect in specific industries.

Second, I will review the macro-economic findings of the impact studies, that is the aggregate impacts on prices, employment, trade and growth. And following that I want to examine briefly the hotly debated issue, in some circles at least, of growth versus the environment, asking the question -- is a no-growth policy required to preserve the environment?

It is necessary to begin with a brief review of the conceptual underpinnings of the industry impact analysis.

The objective of our environmental policy is to improve the quality of the environment and thereby save the society the cost of pollution damage it is now bearing. This is the benefit-cost test my colleagues will subsequently discuss in their remarks.

The method of achieving our environmental objective, enunciated repeatedly by the President, is to internalize the cost, for example, by imposing regulations or taxes, so that production-decision makers and consumers act in a way that causes the reallocation of resources to less polluting activities. Such al alteration in our production and consumption patterns will increase the total national product obtainable from the labor and capital resources available to the economy.

Technically, the Environmental Protection Agency could favor complete subsidization of the private cost of cleanup. We are interested in cleaning up the environment but it would not make economic sense for us to do so, except in cases of acute social hardship. A subsidy to private industries would represent a burden on the general taxpayer, whereas it is clearly the task of the producers and consumers of polluting products to bear these costs. Moreover, subsidization would only serve to delay the economic adjustments required to maximize the total national product obtainable from the resources available to the economy and it would also discourage the development of new techniques for pollution control.

I have said that this process of internalization should and indeed will involve significant alterations in production and consumption patterns. Therefore, profits in some industries will decline, causing capital to move to new types of production, and some prices will rise, causing consumers to switch consumption patterns to less polluting products. As a result of this process some plants will close and there will be some localized unemployment. In other words, to capture the environmental benefits some short-run dislocation costs will be borne.

The purpose of the industry impact studies was to assess the magnitude and significance of these dislocation costs. These impacts were estimated for 14 industries (micro studies).

Let me review the assumptions and cost data used in our analysis: The time period for the micro studies was 1972-1976. The standards for air were the assumed EPA guides to states for achievement of 1975 ambient air standards. The standards for water were the industrial equivalent to secondary treatment, otherwise known as best practicable technology. It is important to note that we have not studied the economic impact of the no discharge provision currently incorporated in the Senate water legislation.

Costs: The table in your hands entitled Cost Input for Macro Model summarizes the cost used in our analysis. You see - Investment costs. (Explain chart ...) Total annualized costs. (Explain chart ...)

COST INPUT FOR MACRO MODEL
(1971 Billions of Dollars)
25 Industries

Investment:	1972	1973	1974	1975	1976	1972-76	1972-80
Air	.8	1.3	3.6	4.3	2.0	12.0	17.3
Water	1.2	1.3	1.4	1.5	1.5	6.9	8.9
TOTAL	2.0	2.6	5.0	5.8	3.5	18.9	26.2
Annualized Costs:							
Air	.14	.39	1.19	2.11	2.36	6.19	--
Water	.87	1.13	1.48	1.87	2.19	7.54	--
TOTAL	1.01	1.52	2.67	3.98	4.55	13.73	
Total Cost: (Adjusted for depreciation)							
	2.95	4.03	7.48	9.48	7.70	31.64	

Caveats on Cost. These costs are our best estimates at this time. They do not account for:

Technology and process change, which could lower cost substantially. This is a conservative assumption for 1972-1976 and would not apply to the long run.

Price changes which could alter the levels assumed by our models.

Different methods of financing while technically not cost reducing, do reduce impacts, such as: (1) Industrial development bonds which permit tax exempt financing of pollution abatement control investment. Corporations can save 1 to 2% on the prevailing interest rate, gain access to new sources of capital, and in some cases extend the length of time over which they can pay for pollution control investments. (2) Use of section 169 of the Internal Revenue Code which permits some pollution control investments to be depreciated over 5 years.

It should be noted in this regard that the Price Commission has ruled that price increases due to pollution control costs are exempted from the Phase II guidelines (Ruling No. 53).

Turning to the quantitative results, here is our general assessment of 14 industry studies: (1) No industries will be serverely impacted. This means their long run viability is not threatened and that most plants will continue to produce and be profitable. (2) But profits will decline for firms that cannot pass on the full cost of pollution control. The most serious problem arises with small and old plants. Small plants cannot take advantage of the economies of scale associated with pollution treatment techniques. (3) These effects can be summarized as follows: Prices - Zero percent to 10% for the 1972 to 1976 period, depending on the industry, or about 0 to 2% per year average for 1972 to 1976. Closures - Of the approximately 12,000 plants now operating in the industries studied, 800 are expected to close in the 1972-1976 period even if no pollution control costs. The impact analysis estimates an additional 200 to 300 can be expected to close because of pollution requirements in the 1972 to 1976 period, and the vast majority of these were likely to have closed in the 1976 to 1980 period in any case. Plant closings are likely in 7 of the 14 industries studied -- fruit, vegetable canning and freezing, paper, iron foundries, petroleum, cement, copper, and steel. Job Losses - Direct job losses are projected to be 50,000 to 125,000 for the entire 1972 to 1976 period. This translates to 1% to 4% of the total employment in the industries covered. It also represents roughly .05% of the 1970 total national work force. On a net national basis offsetting employment opportunities will occur, but not necessarily in the same industry or communities.

Community Impact - A portion of the 200 to 300 additional plant closings will take place in small communities in which these plants are a dominant economic factor. It is estimated that 50 to 150 communities will be substantially impacted.

Our current assessment is that the job losses and community impacts associated with plant closures can be dealth with by existing government programs including: Economic Development Administration loans to impacted communities and industries, Small Business Administration loans, and Department of Labor assistance to assist in job transfers.

Adverse international trade effects are possible in the following industries: steel, paper, petroleum, automobiles, and non-ferrous metals, given our conservative assumption that additional pollution controls are not imposed on foreign producers.

Four industries of 14 studied are expected to make total investment of $1 billion or more in 1972-76 period. These are steel, paper, petroleum, and electric utilities. Greatest requirement is for electric utilities at $8-11 billion followed by steel at $2.4-$3.5 billion, and paper at $3.3 billion.

In terms of the consumer, the impact of these costs will be most evident for electric utilities than for any other industry. As noted, electric utilities will invest about $11 billion, 3/4 for air, 1/4 for water. Annual cost will rise from $338 million in 1972 to $2.5 billion in 1976.

Average control costs in 1976 will be about 10% of 1970 revenues. In accordance with regulatory practice, justified utility costs are passed on to consumers in higher rates. Thus we can expect by 1976 or shortly thereafter, consumers could be paying roughly 10% more for electricity. In the west where more low sulfur fuels are available, increases of 5% or less can be expected. But in the high sulfur coal burning east, particularly the TVA area, increases of up to 15% can be expected.

For the average consumer, the 10% nationwide average could add $12.00 per year to his electricity bill.

Of all industries studied, pulp and paper can expect the most plant closures and unemployment impacts. For this industry as will price increases will hit the top of the 10% range for 1972-76 found in the industry studies.

The $3.3 billion capital expenditure represents an annualized cost burden of $5.50 to $12.50 per ton of paper or a rise of 3.5% to 10%.

Most mills will manage control expenses easily but 329 marginal plants will have difficulty. Even without pollution control expenditure requirements, 30-35 of these will close during the next five years. Pollution control requirements will close another 60-65 mills by 1976 with an associated job loss of about 15,000 jobs. Some of these closings will occur in rural areas where significant community impacts are expected.

Now to the question of growth versus the environment. The appropriate point of departure is our estimate of the macroeconomic or economy wide impact of the costs to meet 1976 standards. In our macro analysis, done for 1972-80 period, we employed an econometric model of the economy. It reported the following impacts:

> Increased pollution control costs will increase industry (capital goods) prices and the overall (consumer) price level. Such increases will slow down demand over otherwise projected levels. This drop in consumption and investment demand will be greater in the aggregate than the increase in the investment demand generated by the increased pollution control investments.
>
> Thus, the rate of growth of the real GNP will be retarded and the economy will fall from its full employment growth patch causing increased unemployment. There will also be trade losses as a result of higher prices.
>
> Compensatory, monetary, and fiscal policies can offset the retarding effect of these expenditures so as to bring growth and employment back to full utilization levels. But this return to the full employment growth path will be at the expense of some price increases and negative trade effects.

The actual quantitative estimate for these impacts are as follows:

Annual Average 1972-1980
(1958 Dollars)

Item	Base	Pollution Control	Pollution Control and Offset
1. GNP	$957B	-$6.0B	0
2. Growth	+4.8%	-1% (-.3% '72-'76) (+.2% '77-'80)	0
3. Prices	+3.9%	0% (+.3% '72-'76) (-.3% '77-'80)	+.3%
4. Unemployment	4.6%	+.1%	0
5. Trade: Current Account Balance	-	-.7B	-$1.9B

I believe the most significant conclusion that can be drawn from these studies is that the economy will adjust to the dislocations resulting from pollution control costs with little aggregate impacts, except possibly in the trade area. The consumer and the producer at large will hardly notice the aggregate impacts on growth, employment, and prices. While some industries will experience substantial impacts, all industries will survive.

As environmentalists we can take comfort that not only do the benefits of our activity exceed their costs for the levels of control presently contemplated for this decade, but the economic impact of these changes in production and consumption in the economy will not bring general economic and general environmental goals in conflict.

Will these conclusions apply for the long run? Are there environmental limits to growth?

The short answer is we don't know. But the issue is worth pursuing for a moment if for no other reason than that there has been recently published a pamphlet titled the Limits to Growth. It reports the results of MIT computer simulations on the subject done for the Cluf of Rome. Limits examines four scenarious. To save time I will address two of these.

The first, which I will call the "Resource Exhaustion System Collpase Secenario" projects continued growth until limited natural resources are exhausted, e.g., coal in 150 years. Industrial production halts and highly mechanized agricultural output which is dependent on industrial production also collapes. The world starves.

The second scenario assumes resource saving technology permits growth to continue but rising pollution eventually poisons the environment so that either we stop growth or die.

Under either scenario these bleak results are expected within about 150 years.

Limits concludes: (1) GNP and population growth must stop. (2) Comprehensive planning must be employed to enforce an "Equillibrium" no growth state.

This is very serious business. Massive income redistribution would be required or otherwise income differences of multiples of 150 would remain common between poor and rich countries. More standardized and routinized living might be in order.

How valid are these results? Are they mere mathematical truisms or do they have empirical content?

My analysis is that these projections should be given little weight at this time. My suspicion is that these results are the product of good computer modeling but poor history and poor economics.

Why do I say this: (1) We do not know that technology will not continue to make natural resources available or substitutes therefor at an exponential rate. It has thus far. (2) Market pricing is not incorporated in the model (reference first scenario). (3) We are not sure that pollution cannot be controlled without bankrupting the economy (reference scenario two). The results we have reviewed today suggest it can. If these costs result in 80% abatement in air and water pollution by 1990 -- on the order of what we project -- a 4% economic growth rate -- which doubles the size of the economy every 18 years, would yield an equivalent level of pollution to what we have today in the year 2012.* (4) Even with our results, while the global and U. S. outlooks are good, some localities,

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* 1972-1990	18 years	20% + 20% = 40%
1990-2008	18 years	80%
2008-2012	1/4 (18)	100%
2008-2026	18 years	160%

including this one, must employ land use planning, transportation innovations and other techniques to achieve ambient standards. In other words, they, must go beyond the 80% to 90% reduction planned nationwide.

Finally, avoidance of noise, visual congestion and other types of environmental impacts may dictate a slower growth rate than dictated by present air and water goals.

In sum, I conclude that: (1) Our environmental and economic goals are not presently in conflict nor are they likely to be so at positive growth rates as far as we can see into the next century. (2) Growth for growth's sake has no place in a society that values its environment. We must be more precise. [Maybe 2% which doubles the economy every 35 years is better than 4%. Maybe at 4% or 2% we need more services and fewer automobiles.] (3) We badly need a better empirical understanding of the relationship between growth and pollution. The Environmental Protection Agency is undertaking to assist in developing this understanding. We would welcome any ideas you have and urge that serious private as well as public analysis be undertaken on these issues.

Thank you.

MR. DE FALCO: You know, sitting up here is really quite exciting. If you saw the diversity and the very intelligence of some of these questions -- I haven't had an audience like this in a long time, so, we're going to have to run through some quickly -- we'll try to bring them down by categories.

Are you ready, Bob?

MR. SANSOM: Yes

MR. DE FALCO: Since when can a competitive firm pass on its increased costs through price?

MR. SANSOM: Well, that depends upon the market.

A perfectly competitive firm can pass on its costs because all firms in the industry have the same costs, and nobody reaches a competitive advantage. If anybody doesn't pass them on, he goes out of business. That's a definition of a perfectly competitive firm.

MR. DE FALCO: Was Leontoff's I-O Table employed in the micro analysis?

MR SANSOM: We didn't use Leontoff's work but the Chase Econometric model used an input-output table to pass through price effects from one industry to the other. For example, if you have an increase in electricity prices, that affects the price of aluminum which affects the price of a lot of consumption goods and is reflected in the price index. So we didn't use input-output models to get the passer effect of prices.

MR. DE FALCO: Why didn't the micro economic study of electric power consider NOX, whereas, the February EPA report did?

MR. SANSOM: I think the answer to that is we didn't have good cost estimates. El, do you have anything to say on that?

MR. BURTON: (Inaudible).

MR. DE FALCO: Why did the micro economic study of electric power consider NOX whereas -- did not consider -- whereas the February EPA report on air did?

MR. SANSOM: Let me say one thing on this. We know in the State implementation plans, because of the problems in finding an appropriate technology to control nitrogen oxides from stationary sources, that the states are not demanding reductions beyond what the technology will permit.

Therefore, the impact studies tried to make a real world estimate of the actual costs and actual impacts. And in this sense, the impact studies are reflective of what's going on in the real world.

MR. DE FALCO: Within the limits of present technology, it is practical to establish harmful limits of air pollutants and then for each community or region determine a maximum population of people and industry which should be permitted under Health and Safety Codes to avoid injury to the health of the community or region?

MR. SANSOM: I think that given our present knowledge of the kind of things I was just discussing, like the rate of technological progress to control pollution, the pollution effects of various types of production, that we are not now in the position to say, this is the optimum population -- the optimum growth rate in the optimum set of social circumstances for a community.

MR. DE FALCO: Here, Bob, your past is going to haunt you. Do you see a basic public interest conflict between the secrecy considerations of national security, for instance about which you are knowledgeable, and the achievement of a balance of national resources and the development of a realistic policy of industries related to national security?

MR. SANSOM: I thought at first the question was related to the environment, I think it's related to the defense industry. Read it again.

MR DE FALCO: Well, it is a lengthy question. The word environment doesn't show up.

MR. SANSOM: Send that to Henry Kissinger.

MR. DE FALCO: Are copies of the economic studies made by the various consultants available to the public? If so, where and how do they get them?

MR. SANSOM: The summary is available through the EPA Public Affair Office. You've got to recognize that each one of these studies is about a three-volume work on each industry, and we have a document available in the press office, as does the Department of Commerce, and the Council of Environmental Quality, that contains only the Executive Summary to these multi-volume studies. If you want the full studies, the Department of Commerce technical information service will make these available to you.

MR. DE FALCO: What counter bill in economic impact, new gross product, new jobs, etc., do you predict coming from the pollution control industry?

MR. SANSOM: That effect is accounted for in the model: First, we crank in these pollution abatement control expenditures. They create employment. They create the additional price pressure on the price index that give you the rise in prices. So the net -- the macro-economic model includes the net effects of both the negative effect on an industry and the positive effect on new industries to build the devices for these plants. So the aggregate results from the table that you have, encompass both the facts. I think one simple and not totally unreliable way to look at this is that the average product of labor in the plants that close is probably much lower than the average product of labor in the plants that open.

And therefore the aggregate labor effects are negative in the absence of compensatory monetary and fiscal policies.

MR. DE FALCO: Has EPA investigated the use of social impact analysis as well as economic impact analysis to arrive at a better understanding of environmental impact? Should you not help to perfect this methodology?

MR. SANSOM: I think the first question is social impacts -- that's what all the benefits analysis we've talked about today and we'll subsequently talk about concerns.

We're looking at the benefits. There is the effects on mortaility and lifetime income that we can put a value on. There's the human grief associated with a death or an early death or an illness that you can't put a value on. There's a value that we would like to assign, but we cannot very precisely assign to esthetics, but we are trying to devise measures, we're trying to look at ways to revise the National Income Account System to take into account more the quality as opposed to the quantity of life. So we're working on it.

MR. DE FALCO: My other question here is that somebody doesn't understand the 3 billion dollar difference between our investment estimate of the electric power industry and the February '72 EPA report and the micro study and is referring pages.

MR. SANSOM: Whoever that is, it might be better to have him come up and discuss it with us.

I think the point is we used a range in all of our micro studies just to cope with this kind of uncertainty about the price effects. I gave you the most probable cost estimates, but we in every case included a range, and in electric utilities we went all the way up to 17 billion to examine the impact. But our conclusions are drawn not only from the best guesstimate, or the best estimate cost, but also the high. So the conclusions that were drawn do account for the 17 billion dollar figure in electric utilities industry. I'd be glad to discuss it.

MR. DE FALCO: Will the cost to the public be monitored? Or will the cost of clean air -- cost of cleanup be an excuse for price increases?

MR. SANSOM: I refer that to the Council of Economic Advisors and the Price Commission and Pay Board.

I think that to the extent that there is competition, the issue will resolve itself. To the extent that there is not competition, that's an issue for the Department of Justice and other people who are concerned about that problem.

MR. DE FALCO: Isn't the possibility of offset based on currently high unemployment? In this case, zero cost is misleading since effective stabilization policy without pollution control would increase gross national product.

MR. SANSOM: That's not true. The problem is that we assume a full employment baseline case, and then once you crank in the investment costs, you get a falling off from that growth path. But, if you'd take the compensatory monetary and fiscal policies on the baseline case, you wouldn't have had more employment because you're already fully employed. What you would have had was higher price rises and more imports.

MR. DE FALCO: Are you suggesting that recent MIT studies utilized bad economics and bad history in reaching its findings?

MR SANSOM: Yes.

MR. DE FALCO: Wow! In EPA's cost incentive for calculations, does EPA use the present value concept of costs and benefits which stream forward in time? If so, what discount rate is used and what is its rationale?

MR. SANSOM: The answer to that is we don't use discounting as much as we ought to. But when we do, we use 10 percent.

MR. DE FALCO: Based on your pollution control cost estimates, what would be the impact on the economy if it were not a full employment base? Say the base for unemployment is 5.5 percent.

MR. SANSOM: It would be positive and bring the economy toward full employment without the requirement for compensatory monetary and fiscal policies.

MR. CARROLL: Well, just before we break for lunch, here are some random questions for you to think about during lunch: How can industries feel competent that they've satisfied pollution regulations as long as local Governments have the ability to legislate in this area.

It can't be very comfortable.

We can spend thousands to satisfy Federal regulations, then have the equivalent become obsolete. That is a risk and we can't control at the Federal level what the locals do.

Here is somebody who says that they know about a radical departure from the present methods of feeding fuel to an internal combustion engine, and that they feel they can prove it to us. And I would invite him to appear before our Air Testimony Hearing starting April 10th in Washington.

This says, why are we ignoring radiation hazards in this meeting? We're not. We had to start from scratch last year. We took those pollutants which had the highest cost in benefit impact, those on which we had some data base. That was air, water and solid waste. Next year we will be including more in the pesticides, radiation, noise and other areas.

FROM THE FLOOR: Excuse me, sir. Why don't you read that question in full -- regarding the radical departure?

MR. CARROLL: Well, I'd be delighted -- It says, "--the radical departure from the present method of feeding fuel to an internal combustion engine has been developed to the point of pre-production models. It allows for any unadulterated hydrocarbon fuel that is free flowing to be used on the automobiles that are now on our highways with a simple mechanism that replaces the present pipes of carburetors as well as being adaptable to new automobiles. Virtually complete combusion is performed if the combusion chamber is in good condition."

FROM THE FLOOR: Thank you.

MR. CARROLL: You're welcome.

Poisoning of predators by the Federal Government and health effects. Would I discuss lead and heavy metals?

And would I discuss permits to spread insecticides by airplanes without safeguards? And what are we doing about safe handling, storage and disposal of pesticides and atomic waste? And discuss Alaska Pipeline statement.

Each one of those is very complicated. We have had to take the predator action, which is a broader based action than we had hoped for. There is a pesticides bill which is past the House now pending the Senate, which will allow us to be more selective in our controls. So we don't have to go for total suspension or total ban.

And on the safe handling, storage and disposal of atomic wastes? Yes, we are doing some research on that as is the Atomic Energy Commission. In both cases, we file public statements on any proposal through the Environmental Impact Statement process.

Here is a question that says, should we talk about data, but the type that is needed, both physical and for clinical health is not being gathered. Therefore, should not we have more monitoring stations at ground level, monitoring of all stationary resources?

Absolutely, we think so.

One of the problems that we've had in EPA is to try to coordinate our monitoring activities. We've had air and water monitoring in the States and the Federal Government and the State and localities have had it, and the U. S. Geological Service, Department of Interior. We're trying to integrate all that monitoring now with common measurements -- common technology so that we can leverage what limited resources we have available to us. We're expanding in that area significantly in 1973 and '74.

What are the expected contributions to pollution control and such devices as the Environmental Impact Statement in the face of entrepreneurial aggressiveness? Some other nasty words.

We feel that the Environmental Impact Statement has been an absolutely marvelous device, because it has brought to the public awareness what must go into the decision process, both for short-term and long-term effects of the decision-making process.

Yes, we're having some trouble with the courts these days, but we don't feel that that's particularly a problem.

How can our current annualized fiscal budgeting solve problems that continue over several years? If you're referring to the water problem, and the funneling of the municipal waste treatment plan, the Senate Bill and the House Bill both have contract requirements which will be outside the annual budgeting process. If we base our regulations on health, or does that consider chronic long-term effects on health? Yes, it does. Not just short-term.

You have mentioned that you have no product as such, but your research is a product. What method of private industry research funding do you use?

On the first question, what I meant by product is that we don't have the remission or the responsibility such as the Department of Commerce to increase industrial profits and growth or such as the Interior to develop public lands, be it timer cutting or oil shell development or the like.

Yes, research is a product. The sort of study you had today is a product. We use both grants, contracts, and any method we can to best achieve the research end.

Here's a question that says: How can the Government through EPA expect the citizen to clean up if they don't? It refers to Admiral Zumwalt's memo of the other day in which he advised his new officers to spend some money this year so they won't get cutbacks.

It is interesting that we are now considering proposed vessel regulations, as I think I mentioned earlier, but it's the Navy who stepped out even before that regulation was promulgated, and announced last week that in San Diego Harbor they are under a program where they will have holding tax and absolutely no discharge on their vehicles -- or on their ships within three years.

Why is not noise abatement and safety considered as important as the mentioned subjects?

Again, it's a question that we started on what base we had. During the course of 1970, pursuant to the Clean Air Act of 1970, we did a study on noise, which again we feel is one of the most comprehensive ever undertaken. One of the weaknesses of that study was economic data. We found that we had very little economic data on noise. We found in the literature and other activities, in both Private and Public Sectors, very little data on the chronic damage of noise -- and that report, if anybody is interested in it, we'll be happy to submit to you. We have that at the EPA Public Affairs Office and we'll have something on noise economics for your year-end benefits.

And this asks -- it says: Don't we sometimes have trouble with the Commerce Department or other departments of the Government who don't want to do the same things that we want to do? And it says: Who has the final say, particularly in the case of pesticide legislation?

Well, obviously, the final say is the Congress, and it's one of the marvelous things of EPA -- we're cross-cutting across the Federal Government that we do involve ourselves quite often in adversary relationship between the Department of Commerce or the Department of Interior, Agriculture, and the like, but that is one form that we go through and we have sort of a melting pot process to try to represent a diversity of points of view before that regulation comes out in the first place.

That's the general questions, Paul.

MR. DE FALCO: Thank you, Tom.

Before we break for lunch, I have an announcement.

We will reconvene promptly at 1:30. The meeting stands adjourned.

Afternoon session.

MR. DE FALCO: May we reconvene please.

Ladies and gentlemen, I have several announcements before we get into the afternoon session of the program.

One, there are some, I understand, urgent telephone messages on the bulletin board in back for the following individuals: Harry Griffin; Arthur Sutton; Dr. Moorehead; Phil Voorhees; Alec Stenman; Dr. Joseph Meltzer. There are messages on the board in back. Would you please consult them.

Two, in the handouts this morning, you received two individual sheets of paper. One in particular is headed, "Annual Average 1972 - 1980, 1958 Dollars." There is a correction to be made on Line 2 -- a rather significant correction. Item 2, Growth, the base is plus 4.8 percent. Pollution Control is minus .1 percent. Not minus 1 percent, as it appears. Which in other words, would bring the base down 4.7 percent. So if you'll correct your handouts.

Thirdly, we've had a number of requests for a transcript of the meeting, including the questions and answers to be made available. Could I get a showing of hands as to those who would be interested in receiving such to determine whether we should go through the works?

MR. DE FALCO: I guess it isn't even close. Okay.

There is another item here: What system do you use for distribution of information on current research or needs for research, etcetera?

Most of our studies, and in particular all of our research studies, are filed in Government depository libraries which are usually University libraries in most of the major cities in the country and are available from same. They are also available, in most cases, from the Government Printing Office.

Now I shall start the program.

Tom, would you introduce the next member of your staff?

MR. CARROLL: Ellison Burton is now Director of the Air and Radiation Program Systems Division in the Office of Planning and Evaluation, in the Office of the Assistant Administrator for Planning and Management, in the Office of the Administrator of EPA. And that just shows you that we haven't forgotten how to be bureaucratic.

He graduated in 1951. Bachelor of Arts cum laude in mathematics from Amherst. He received in 1957 a Diploma in

Mathematical Statistics from Cambridge University, Trinity College.

Ellison started his work career in 1951 as an analyst in input-output studies at the Bureau of the Budget. He had a tour of duty in the Navy. He had a variety of positions in administrative management and technical management with consulting firms through 1966, but since 1966 until last year, he has been with Erust & Erust as Director of the Environmental Studies Group of that management consulting firm. It has always intrigued me that as consultnat to the then National Air Pollution Control Administration, Ellison wrote the first report to Congress on the cost of clean air. I think we're now up to our seventh, is that right? This here is number 7?

MR. BURTON: No, it's the fifth.

MR. CARROLL: Fifth? Well, that shows that he's been with us for quite a while. He's done work in tax incentives in mobile source pollution control submission alternative strategies, computerized simulation approach to analysis of regional plan, both air and solid waste, and is now responsible for all of our planning for air pollution control and for radiation.

Elli Burton.

MR. DE FALCO: While Ellison is getting up to the podium, I have two other announcements for those of you who came in late in the day or this afternoon.

Questions to the panel: If you have any questions, would you please raise your hand. I have staff walking the aisles with three by five cards. Put your questions on those cards, return it to them and they'll be sent up here.

And secondly, I must apologize this morning for keeping you seated as long as I did. We'll try and take a break sometime midway this afternoon. Thank you.

MR. BURTON: You have already heard the welcome news that pollution control programs, while entailing substantial costs, are not going to turn the country into an economic wasteland. It is possible to be somewhat more positive than that, however. I will discuss evidence that implementation of the Federal Clean Air Act is likely to provide net economic benefits to the public in the form of better health, and a cleaner, more enjoyable environment.

First, let me briefly review some major provisions of the Federal Clean Air Act.

The law defines clean air in terms of attaining national primary and secondary air quality standards for pollutants judged to pose a threat to public health and welfare. Attainment of a primary standard is protective of public health, while attainment of a secondary standard protects from all other air pollution damage. On April 30, 1971, EPA promulgated primary and secondary national air quality standards for sulphur oxides, particulate matter, carbon monoxide, photochemical oxidants, hydrocarbons, and nitrogen dioxide. These standards are based on the levels at which these pollutants have been observed to have adverse effects on human health, property, materials, animals, vegetation, and safety.

By the end of January 1972 the states were to have submitted plans providing for implementation, maintenance, and enforcement of the primary standards. Almost all states have submitted such plans. The law allows up to an additional 18 months for states to submit plans for attaining the secondary standards.

A major provision of the Act having an important bearing on any discussion of costs and benefits requires that emission of carbon monoxide, hydrocarbons, and nitrogen oxides from 1975 and 1976 autos be reduced at least 90% from 1970 to 1971 levels.

EPA's assessment of the costs and benefits of implementing the Act are contained in an annual report to the Congress. The summary chapter of this year's report has been distributed to you for reference. The full report, entitled "The Economics of Clean Air", is available as a Senate Public Works Committees print from the Superintendent of Documents in Washington, D. C.

Five Fiscal Years, 1973 through 1977, are covered in the report. Coincidentally, 1977 is the year in which any major extensions which might be granted under the law run out. So it is a good year to use as a basis for cost-benefit analysis.

What will be the size of the national air pollution problem in 1977? Table 1-1 shows if further controls were not required, 1977 emissions would exceed 36 million tons of particulate, 46 million tons of sulfur oxides, 217 million tons of carbon monoxide, 41 million tons of hydrocarbons, and 26 million tons of nitrogen oxides. We estimate that these uncontrolled emissions will cause 25 billion dollars damage to public health and welfare in 1977 alone. Table 1-2 and 1-3 show how this potential damage is distributed. It is important to note that over 21 billion of this damage is attributable to particulate and sulfur oxides emissions. But this is not to say that oxidant, nitrogen oxides and carbon monoxide cause only the remaining 4 billion of damage. In Table 1-2 please note footnote 3, which says that no health and property damage is included for these three pollutants because of lack of information. There are reasons to believe that the economic damage caused by these pollutants is substantial however. In 1977, mobile sources, if controlled, would contribute about 3/4 of the CO, over 1/3 of the NO_x, and about 2/3 of the HC. Since NO_x and HC interact in the presence of sunlight to produce photochemical smog, mobile sources probably cause most smog formation. Stationary fuel combustion sources emit most of the balance of these pollutants. Some health and property damage is ascribed to mobile sources in Table 1-3 but only from minor amounts of particulate and SO_x emitted. Compliance of stationary and mobile sources with EPA guideline standards will produce about a 40 percent reduction in particulate emissions, an 80 percent reduction in sulfur oxides, a 60 percent reduction in carbon monoxide, a 20 percent reduction in hydrocarbons, and a 60 percent reduction in nitrogen oxides. These national emissions and reductions are shown in the bottom line of Table 1-1.

The total fixed plus operating cost in 1977 to achieve these emission reductions is estimated to be 12.3 billion dollars annually, in 1970 dollars. You will note that of this total, stationary source control costs are estimated at about 4 billion dollars annually, while the mobile source control costs are estimated at over 8 billion dollars. Cumulative costs during 1973-77 will total 24.7 billion for mobile sources and 17.2 billion for stationary sources. A few words about the reliability of these estimates.

The stationary source control costs are based on the application of reasonably available technology. In most cases this is technology about which we have considerable engineered cost information on purchase, installation, maintenance, and operation. An important point is that the designers and suppliers of stationary source emission controls are highly competitive and usually independent of their customers. As a result, there is much more advertising of wares, more open literature, and many more sources of reliable opinion upon which to base cost estimates. In short, we regard the 4 billion dollar figure as a fairly reliable estimate of the 1977 annual cost of stationary source compliance with EPA guideline standards.

The automobile is a source of a different color, as it were. Here we are requiring direct modification of the product rather than the production facility. The 1975 and 76 standards are stringent, however, and reliable control technology capable of meeting those standards is still under development. We are therefore almost wholly dependent on the industry for information on the final emission control design and cost factors for 1976 and 1976 cars. A wide-range of estimates have been provided to us by the manufacturers for the various technical approaches they are considering. In computing national costs we selected a single technical approach which appeared to us to be most likely to meet all requirements through 1976. We used 350 dollars per car as our working estimate.

I want to emphasize that this cost applies to a rapidly developing technology. You should accept it with the understanding that it may change considerably.

Let's assume though that 12.3 billion dollars is the national cost in 1977 of bringing both stationary and mobile sources into compliance with the Clean Air Act. What benefit will we derive from this huge expenditure? Table 1-4 shows an estimate of over 14 billion dollars in reduced damage costs in 1977 as the economic benefit resulting from the national emission reductions shown in Table 1-1. In other words, the annual economic benefits exceed annual control costs by about 2 billion dollars in 1977. Over the 5 year period 1973-77 we estimate that economic benefits will total around 60 billion dollars while the cumulative control costs amount to 42 billion dollars.

In Table 1-4 we see that the separate economic benefits from controlling incineration of solid waste, stationary fuel combustion (including electric power generation), and seventeen major industrial process industries are greater than the control costs for each of these source classes. For mobile sources, though, the opposite appears to be the case--costs outweigh economic benefits. The appearance is grossly misleading. You recall those very important footnotes in Table 1-2 and 1-3 which say that we have essentially no information on the health and property damage done by mobile source-related pollutants, except for that ascribed to minor amounts of particulate and SO_x. Mobile source-related damage data thus refer almost wholly to materials and vegetation damage. Economic benefits shown for mobile source emission controls, therefore, is derived only from reduction of damage to materials and regetation. Although, we have little or no data on the economic costs of health damage from CO, NO_x, Ox, we can cite specific adverse physical effects of these pollutants on people. But we are not very well informed on the changes that occur in health damage as concentrations increase above the primary standards. We also do not know very precisely the portion of health effects attributable to mobile sources and portion attributable to stationary sources of these pollutants. Moreover, that apportionment is probably differenct for every city in the nation.

There are, in addition, for mobile as well as stationary sources, non-economic damages caused by air pollution, including aesthetic insults, degraded quality of life, and pain and suffering caused by pollution-related health effects. Although non-quantifiable, these effects are no less real to those affected and must be taken into account in any discussion of the benefits of pollution control. For all of these reasons it is presently impossible to carry out even a crude cost-benefit analysis of mobile source pollution control. Such an analysis must:

1. Determine the damages resulting from exposure to pollutants at various concentration levels, not just at the level of effect providing the basis for our standards.

2. Determine the relationship between emissions and pollutant concentrations that impact on health.

3. Calculate the costs associated with emission control.

4. Utilize a correct benefit-cost methodology (e.g. cost streams, discount rates, etc.).

A proposal that has recently received some notice involves a two-car strategy. By this is meant stringent controls on cars operated in highly polluted areas but less stringent controls on cars operated in relatively clean areas. This proposal is put forward by some who believe that the national controls mandated by the Clean Air Act may not be economically justifiable even though auto emissions are a severe problem in some cities. However, no cost-benefit analysis has been offered to justify the optimism that significant cost reductions could be realized by a two car strategy. Since new legislation would be required, several important questions affecting costs and benefits would have to be answered before a legislative proposal is considered seriously. First, can auto manufacturers design and make twice the number of models at a reasonable cost? Second, how could people be prevented from buying high emission cars in unpolluted areas and operating them in polluted areas? The third, and perhaps controlling, question is whether the cost savings of a two car strategy justify the political, technical, and administrative difficulties of implementing and enforcing it? If, as may be the case, the additional cost to meet the 1975-76 standards is only 50 dollars per car, the answer is probably no. If it were, say, $1000 per car, the answer might be different.

The lack of information on mobile source-related pollutant damages and benefits means that the gross cost-benefit comparison made earlier of 42 billion of costs vs. 60 billion of benefits over 5 years is very conservative since we included all mobile source control costs but almost no benefits of such control.

I would like to mention in closing that we are studying less costly ways of achieving clean air. For example, we are exploring such concepts as regional least cost strategies, which may be on the order of only a fourth as costly as typical strategies now proposed. It is possible that least cost strategies could be implemented through the use of effluent fees or other incentives for effecting self-regulation. The ideal system would achieve substantial benefits from air pollution abatement not only at minimum cost but also with minimum regulatory intervention. We will have to "go some" to achieve the ideal, but in the meantime, while the level of cost and regulation may be substantial, we are convinced that on balance cleaner air will produce substantial net benefits for our whole society.

MR. DE FALCO: What is the cost in terms of air pollution damages to urban dwellers? Can you suggest any research done in this area?

MR. BURTON: What is the cost?

MR. DE FALCO: What is the cost in terms of air pollution damages to urban dwellers?

MR. SANSOM: Do we have anything in the micro studies on that?

MR. BURTON: No, I think the cost to intra-city dwellers, estimated in the Lave & Seskin studies on which our 16 and 25 billion figures were based, were cross-sectional econometric analyses of urban areas. So these damage figures are based upon damages measured across urban areas.

MR. SANSOM: We haven't broken it down by cost per family. I thought that was what was asked.

MR. BURTON: You mean -- I see, the allocation of the costs.

MR. SANSOM: Yes.

MR. BURTON: No, we haven't distinguished between urban and non-urban.

MR. BURTON: There was a question from this morning that I was holding to answer. Someone asked, "Why didn't the micro economic study of electric power consider nitrogen oxides control whereas the February Economics of Clean Air did?" Well, the February report did not. We included the emissions and they're shown in Table 1-1, but we applied no emission control technology model against that, so there was no reduction of NO_x from stream electric power plants.

MR. CARROLL: Why don't we have data on the effects of single and total pollutants CO, NOX, HC? And how much money is being spent to find out?

MR. BURTON: Well, I think we have not because the studies were not fielded long ago, and these have to be long-term studies. Nothing has paid off yet that gives us the kind of damage information that we need, but EPA has increased its budget in this area this year.

MR. CARROLL: We're planning to do it in fiscal year '73.

UNIDENTIFIED SPEAKER: That starts in three months.

MR. CARROLL: Will you relate the costs of clean air to individuals by income class? I.e., one group cannot pay and the other extreme can pay. However, it seems that to a large number of low middle-income people, this will mean a large drop in their standard of living -- no car at all instead of a cheaper one, no trailer to enjoy the environment.

MR. BURTON: Well, these have been considerations. In some economic circles it's been pointed out that lower income groups are capital goods oriented; that's what they would go for with increased income. So, I guess in that sense, pollution control costs might tend to raise the costs disproportionately with regard to that group. But I think that the longer term considerations are that improvements in health and welfare for the total population bnefit all classes, increasing productive life, reducing medical costs, and so forth.

MR. SANSOM: Also, that the lower income classes in urban areas where the concentration of air pollutants are located, stand to benefit more.

MR. CARROLL: What percentage or removals of five primary air pollutants are contemplated in the 8 to 11 billion dollar figure? What considerations are given to switching from fossil fuels to nuclear or other sources?

MR. BURTON: What was the first part of that?

MR. CARROLL: What percentage removals of five primary air pollutants are contemplated in the 8 to 11 billion dollar figure?

MR. BURTON: The reductions that we played for this cost report are given in that Table 1-1, if I understand the question.

MR. CARROLL: That's right.

MR. BURTON: As to shifting from fossil to nuclear, this is certainly an active program. EPA does not have a position as such on nuclear power. I think that under the National Environmental Protection Act, our position, if it can be called one, relates to each individual environmental impact statement that we review. I think that probably this issue is under consideration. We don't have any pronouncements to make about it, but we're certainly concerned and aware and looking into tradeoffs between fossil and nuclear power.

We have an inter-agency committee that relates to the State implementation plan. We're concerned about the State implementation plan's being technically implementable and, therefore, we're concerned about what Federal policies might have to change in order to free cleaner fuels, and so on, into the future. We are working with other Federal agencies in trying to develop answers to some problems and we have on this committee a couple of nuclear experts from my staff and these problems of trade-off between fossil fuel and nuclear power will be considered.

MR. CARROLL: Elli, what is the status of power station pollution control devices converting sulphur to sulphuric acid? Wouldn't these devices have an impact on keeping down the price of electricity?

MR. BURTON: The effect of sulphuric acid on these -- on the cost of these devices? You mean by --

MR. CARROLL: AS I read the question, I think they're asking if you remove the sulphur, convert it to sulphuric acid, isn't that a net reduction in your cost?

MR. BURTON: Well, the idea of by-product recovery has been around the landscape for a long time, and very much talked about. I think that it depends upon where the plant is and what its capabilities are for marketing the by-product. Some people are optimistic in some areas about this and not so optimistic in others. It's been pointed out more than once that people that are in the business of selling electric power probably are not going to put their best people on the problem of selling sulphuric acid.

MR. CARROLL: I think, also, the sulphuric acid market is quite down today --

MR. BURTON: Yes, I think so.

MR. CARROLL: What specific damage does particulate and sulphur oxide do to residential property? This is in reference to Table 1-4 and 1-2. Is this new paint jobs, corrosion -- seems awfully high to this --

MR. BURTON: Well, there were at least two studies done on property damage. One by Anderson and Crocker and another one by Ridker in St. Louis, and actually among all the damage studies that have been done, the Ridker and the Anderson-Crocker studies are considered to be among the better quality studies. It's hard to say that any studies of damage are really what you'd like to see, but it's what's around and they're really at the mercy of the data that are available.

But, I think those two studies were fairly decent studies. And I think that the numbers that they've come up with are fairly believable. I don't have as much trouble with the property damage estimates that they came up with through the use of multiple regression analysis as I do with the possibility that we might be double counting, that we might be crediting damage to property on one hand but then also looking at other impacts on welfare. There's one theory that by looking at damage to property you are automatically taking into account other damage impacts on welfare. But this is just another debate.

MR. CARROLL: Why does not EPA research new motor power such as the steam engine to eliminate problems of various controls on a single engine more polluting as internal combustion? How about steam?

MR. BURTON: How about steam?

MR. CARROLL: Well, the real question is, what research are we doing on alternate power sources?

MR. BURTON: I think our budget is 11 -- 10 or 11 million dollars.

MR. CARROLL: 10.2 million.

MR. BURTON: Searching for the low-pollution vehicle, that's what it's called.

MR. CARROLL: It's 10.2 million in each year. There's a variation of about 50 thousand dollars between years.

MR. BURTON: Here we're talking about a near-term and a longer term problem. In the near-term, we're talking about meeting the 1975 - '76 or '76 - '77 deadlines for model year cars in those two years. It's very unlikely that any of these new technologies could really be mass produced in time to meet the demand for those years.

In the longer term, if you look at projections of auto emissions into the future, you see, given the '75 - '76 standard, that HC, CO, NOX peak out and then go down until about the middle '80's, and then they start going up again, even with these very stringent '75 - '76 standards, and the reason for that projection is based upon the projected automobile sales in the future, which steadily increase and the fact that 50 percent of the cars are still on the road after nine and a half years. All of the used cars don't disappear from the road until close to 20 years. So even after 10 or 11 or 12 years, you still have a substantial number of cars on the road.

If you look ahead then to 1985, you still have a lot of pre-'75, '76 cars on the road then, and just the sheer numbers in addition to that are going to start raising these emission levels by the mid-'80's and into the 1990's. Then the curves would start going up more sharply. So, I think that the low-pollution vehicle research program is going to have to come up with something p.d.g. in order to head off that problem.

MR. CARROLL: Would it be workable to phase out all lead and gasoline by 1975 or 1976? How would this affect individual car owners?

MR. BURTON: Well, the regulations out provide for at least one grade of unleaded gasoline by, I think the onset date is '74, to be ready for the '75 model year cars, which would be delivered along about the end of '74, and a gradual reduction in the lead levels of premium grade gasoline. Now, the requirement for at least one grade of unleaded gas was put there in order to facilitate the use of catalytic after-burners to reduce HC, CO and perhaps NOX from the '75-76 automobiles. Lead poisons most of the catalysts that are being considered for the '75-'76 cars. You'd have to do something then to insure that we're not simply decommissioning all these catalytic systems by allowing too much lead in the gasoline the people buy.

Now, there is a possibility that there might be some increase in gasoline consumption as a result of the use of unleaded gasoline. Probably, it will increase our crude oil consumption somewhat, and may increase the amount of fuel required per car somewhat. I think that the figures we have, which I don't have right here, unfortunately, show that the increased costs are not that substantial.

MR. CARROLL: How do you see the gap between standards for NOX and CO and the technology available being closed? Are you optimistic about future developments coming more rapidly than in the past?

MR. BURTON: I think there's no question that developments are going to come more rapidly. How optimistic I am, I'll be in a better position to tell you after our forthcoming hearings on the Volvo application for a suspension of the 1975 standards. Those hearings begin April 10th. We're looking into everything we can look into in order to be as fully informed as we can be so that we can ask the right questions. I think that when you put two EPA people in a room and ask them their opinion on meeting the '75 - '76 standards, you're going to get at least three different opinons.

I think we're very open minded at this point. Well, that's all I can say. We don't have any preconceived ideas. We want to "get the facts, Ma'am." That's what we want to do at these hearings. We don't think that they're a charade. We're really trying to get the facts.

MR. CARROLL: Your arriving at your $350 manufacturing cost for pollution control on '75 - '76 cars, are you including such items as the cost to the dealer for capital to buy and stock such cars?

MR. BURTON: No.

MR. CARROLL: Other selling costs to dealer?

MR. BURTON: No.

MR. CARROLL: Shipping cost to the added weight?

MR. BURTON: Well -- it's hard to get awfully excited about that.

UNIDENTIFIED SPEAKER: -- But coming back, $350 is not a manufacturing cost. That's an estimated sales cost, isn't it?

MR. BURTON: Well, no, that's with markups. It's sales cost.

MR. CARROLL: Are trade-offs being considered for the Private Sector of air pollution control? I.e., allow power companies to build new plants as necessary if they will convert all of their motor vehicles to the LPG or other low emission type fuels?

UNIDENTIFIED SPEAKER: You got a question.

MR. BURTON: That's really out of our purview, I guess -- or our legislative mandate --

MR. CARROLL: Next question: Has it occurred to anyone at EPA that there may be systems of organizing cities that do not require each individual to own his own vehicle? What would be the economic effect of such modifications?

UNIDENTIFIED SPEAKER: I was told they were creative in California.

MR. BURTON: All of the above.

MR. CARROLL: I think that deserves a serious answer, Elli. We are thinking about a variety of alternatives, and as we look at the State's implementation plan, aiming toward 1975, very many of them are assuming a dramatic reduction in the amount of vehicles brought into the central core cities. They are assuming some form of public transportation, but they're just saying that that's a plan and an intent. As of today, they have not yet considered how they're going to achieve that intent. Whereas, indeed, intent can always change. This is a concern that we have with those implementation plans. We are trying to work with the Department of Transportation on it.

Now that is another version of the two-car strategy that might apply, as suggested in that question. You may have just certain low emission vehicles that don't have all the performance characteristics of today's cars, but would be the ones used in central cities. Now, that is a form of a -- could be a form of a taxi type of a public transportation system. We are thinking about those.

MR. BURTON: Right. If you're talking about --

MR. CARROLL: We are sort of in a just-thinking sort of stage, however,

MR. BURTON: If you're talking about meeting the '75 - '76 standards, we are actively involved. I thought the question was referring to organizing future cities. You know, building fresh or something.

Some of the things that are being considered by some states and their implementation plans have included such things as mass transit, retrofitting cars, banning downtown parking in some or all areas, synchronizing traffic lights in order to increase the traffic flow and thereby reduce the number of grams per vehicle mile that are emitted per vehicle -- various concepts.

There are many complex questions here, and the first problem really is to understand that some of the things that you do for air pollution control purposes may work against things that you might do for transportation purposes, so in sort of analytical terms, you have to constrain the whole problem with the payoff that you want from all of these things. You have a transportation system to carry people from A to B, loss of different A's to B's. And air pollution control is one of the things that you want to try to optimize. You can't really build the system to minimize air pollution control. The way to do that is to have everybody walk.

So, you have to have your head screwed on right before you just sort of haul off and say, "Do this because it seems to look good from the air pollution point of view." In the first place, when we talk about mass transit, we're talking about buying buses or digging holes in the ground for subways or whatever we're going to do, we're talking about lots of money. And there is a real question of cost effectiveness here, and we are trying to lay out the problems and what the alternatives are for solving these problems.

But here again, those are state initiatives with Federal help. The Feds can infuse money into these areas to help them buy buses and synchronize lights and so on. But we can't -- except in those cases where we promulgate plans we can't really say, "do that or don't do that."

MR. CARROLL: We have a question here that asks that we touch on the health cost of the air pollution and the amount of L.A. revenue lost due to individuals having to leave the Basin.

Obviously, all of our studies have been national so far, but we did have it indicated to us at lunch that Dr. Lester Lees at Cal Tech has done some work on this Basin, and whoever wrote this question, I'd suggest you talk to Dr. Lee.

MR. CARROLL: Before we break for about 10 minutes, I'd like to make one other announcement.

A number of you who arrived late did not receive a copy of the booklet. Your names and your registration cards have been set aside, and you will receive them by mail.

We can break now for about 10 minutes please.

MR. CARROLL: Well, now we turn to water. A little more difficult area, but as I indicated to you this morning, the benefit data here is even more difficult to collect, to measure, to define, much less quantify.

To talk to you about water is Mark Pisano. Mark is one of the youngest and newest members of our staff, but I hope you won't hold that against him because he's from California. He received his Bachelor's from Georgetown in Economics in 1964. Came home, and studied at the University of Santa Clara where he received his MBA in 1966. He received his Master's in Economics in 1969 from Georgetown, and he optimistically says he's going to receive his PhD from Georgetown in Economic this fall.

He has worked for EPA off and on on a part-time basis for a number of years. He has worked on the Cost, now the Economics of Clean Water for three years. His specialty has been modeling and non-linear programming. I would just like to say in passing that Mark's work in this economic area and analysis of the construction industry for municiapal waste treatment, and the pricing out of the various bills that were proposed in the Congress and by the Administration has played a very major factor in getting us to the legislative position where we are today, where we feel that -- especially the House bill is a much workable solution than the one in the Senate. That's not going to be up for us to decide, but I just want you all to know -- to share with me the good work I feel that Mark has done in this area, and now why don't you tell us a little more broadly about water.

MR. MARK PISANO: Thank you, Tom.

I'd like to start my talk off with a little analogy comparing Washington, D.C., with California. It's often said that when Bob Hope jokes, he gets a rather roaring response in turn, and in Washington it is often said that when Congress makes a joke, we end up with a bill.

MR. CARROLL: I appreciated it, Mark.

MR. PISANO: On a more serious vein, Jim Kreiger mentioned at lunch today the importance of 1972 and the Water Program. And truly, 1972 does mark a change in the thrust of our Clean Water Program. During this year, a new Water Bill is pending which could alter the scope and course of action for cleaning up our nation's water. The requirements of this legislation would make the attack on water pollution one of the largest public works programs ever undertaken.

The Environmental Protection Agency is attempting: first of all, to assess the required magnitude of resources that are truly needed to be expended; second of all, the most cost effective way of expending these resources such that the levels of water pollution reduced are commensurate with the benefits that our society will gain.

The starting point of this analysis is an assessment of what magnitude of expenditures are needed. We attempted to conduct a national survey of the extent of water pollution. To assess the trends in water quality improvement, we are developing an indexing procedure which measures both the prevalence of pollution, that is, how many stream miles are polluted as well as the duration and intensity of pollution. This index uses as a basis, data which meausres deviations from the existing water quality standards. The water quality standards for those of you who might not be familiar with them, basically have three criteria. The first criteria are biological criteria that indicates the extent of pollution in the water. The second criteria are the uses that can be derived from various levels of ambient water quality criteria. And the third part of the standards are implementation programs required to achieve the desired uses or benefits.

In 1970 the first assessment of water pollution was made. It was indicated that 27 percent of America's waterways were polluted. A similar assessment was conducted in 1971, and that survey found that approximately 29 percent of the waterways were polluted. Every part of the nation had some pollution, however, the shares were quite unevenly distributed.

In 1971, there were almost twice as many miles polluted in a relative sense in the East than there were in the West, using the Mississippi as the dividing line.

If you turn to Table 6 of the handouts for the water talk, you can get an indication of the relative distribution of the number of miles polluted. Furthermore, if you take the first five regions as opposed to the last five regions, you can get an indication of relative incidence of pollution throughout the nation.

One of the possible explanations of why the West fared better than the East could be that the pollution problems were not as severe to begin. We recently came across a study conducted in 1937 where they conducted the same exercise that we did. It is interesting to see the relative distribution of pollution. To a certain extent the trends that were with us in 1937 are with us today. Another possible explanation for the differences in the distribution of pollution is that in the Western states water is a scarcer resource, and because of this, it's more likely to be conserved or used more productively.

The percentages of the prevalence of pollution is actually not a very satisfactory figure -- or very comforting. It's much like comparing common colds with cancer when assessing health conditions. For this reason, we attempted to assess not just the prevalence, but also the duration -- how long pollution occurred -- and the intensity of that pollution.

When this duration and intensity factor was taken into account, the relevant prevalence of pollution across the country held, i.e., the same trend continued. This also can be seen by looking at Table 6 and looking at the duration and intensity factor as a percentage of the U. S. mean.

In sum of this assessment of how bad pollution is in the country today, I'd like to say that there were several data anomalies that might have influenced that change from 27 to 29 percent. In the latter year assessments, states were more careful concerning their measurements, moreover, we then considered third order water sheds in the later survey. Basically, because of these alterations, we concluded that pollution in 1971 was probably just about as bad in 1971 as 1970. Furthermore, we noted that there are real pockets or concentrations of pollution. And for this reason, we felt that we wanted to tailor and gear our program such that we attack the problems. We don't want to spread our resources so evenly across the country or uniformly that we don't accomplish anything. For this reason, the Administration has been supporting an allocation formula based upon needs, i.e., the need to construct pollution facilities.

Concerning the level of expenditures required to reduce the percentage of our waters that are polluted, we conducted an assessment of the costs of industrial and municipal expenditures.

But before I get into a discussion of these costs, I'd like to start off with a general premise that we utilize in assessing the required level of expenditures, namely, we want the marginal benefits and costs of the various treatment levels to be considered.

From a national point of view, it is necessary to insure that the water pollution goals that are sought are defensible. We don't want water pollution goals that don't give the public the benefits that are commensurate with the expenditures that they're going to have to make. Analysis of the marginal costs at different levels of treatment suggests that as you go to higher levels of treatment, the costs rise almost exponentially. This fact can be seen on Figure 2 in Table 9 of the handout.

In a rather gross sense, I can't say that we've gotten cost functions that indicate levels of pollution controlled to percentage of costs for particular plants. Rather, it's more an envelope type curve. We can see that as we go to higher levels of treatment, 98 and 99 percent, that the costs are extremely high. For those last few percentage points of pollution removed, the cost increases from 50 to 250 percent per each unit of residual removed.

In light of this exponentially increasing cost function, we assessed what level of expenditures are needed? What level of expenditures can the Administration support at this time?

Well, in general the water quality standards that I mentioned before require an equivalent of secondary treatment or best practical treatment which is basically in the 85 to 95 percent range. The improvement in beneficial uses of water from such expenditures are likely to be great compared to the cost, particularly when you consider this in light of high levels of expenditure. Cost benefit studies that have been performed -- one of the classic cases in the water area is the Delaware River Study -- have demonstrated that the benefits at this 80 to 95 percent range are greater than the costs.

For this particular reason, it was felt that the Phase I levels of expenditure in both the House and the Senate bills, that is the Phase requiring best practical treatment in the Senate and best practical treatment available in the House, could be supported by our knowledge of benefits today. However, to go to high levels of treatment, to go to the Phase II levels of treatment, it was felt that before we ask society to pay for these costs given in that exponential curve, we ought to subject those expenditures to a cost benefit test.

I ought to note in the derivation of this exponential cost curve we have not taken technological changes into full consideration. At this point in time, it's difficult for us to assess all the technological implications, so while this might appear static, it's our best estimate of the costs at this point in time.

On the other hand, some water quality expenditures and some water quality standards at this point in time do require us to go to higher levels of treatment. I can give examples, such as Lake Erie, Lake Tahoe, etc. Thus, in some instances we are going to be requiring municipalities and industries to be going into these higher levels of treatment.

The strategy that we employed is one of supporting a base level where the benefits appear to be greater than the costs, and as we go to higher levels of treatment to insure that we have taken into full consideration the social and economic implications of going to that higher level. Thus our first concern in all of these expenditure requirements is that we improve the ambient environment.

The Phase I expenditures, or the costs for providing for the necessary facilities for meeting water quality standards have been estimated at about 18.1 billion for municipalities. This cost estimate was obtained by surveying state and local communities, ascertaining what levels of expenditures, they estimate are going to be required to meet water quality standards for the period 1972 through 1976.

However, another estimate has been made by EPA, which is somewhat lower, 14.3 billion. This estimate was obtained from an economic projection model that we have developed. Basically, this model takes into consideration the backlog of facilities needed, the growth rate in particular states, and the replacement value of facilities already in place.

The difference between these two estimates are, the State survey indicated what communities felt that they needed to build, and in many instances did not take into consideration many of the supply constraints in building these in the stated time period. Furthermore, in many instances they were not based upon fully priced-out engineering estimates or plans or specifications. Rather, they were guesstimates of what was likely to happen in the future.

The EPA estimating model did try to adjust for this by using nationally derived cost functions in pricing-out the facilities. Therefore, we are able to get a better estimate of facilities to be constructed.

At the current time, we're trying to get a better understanding of some of the supply considerations. We're trying to understand why we have an increase in new starts, but our current level of completions is the same as it was three or four years ago. We're also trying to assess why we're experiencing a 14 to 15 percent price increase in this particular construction sector. If this is allowed to occur, then much of the increased expenditures will just be eaten up in price increases. We want to have a better understanding and a better control of the allocation process in this construction sector. Furthermore, we're trying to understand why it's taking us longer to build facilities. The average lag for construction of facilities has gone from about 22 months 5 or 6 years ago to almost 50 months today. The longer it takes to construct projects, the longer it's going to take us to achieve our national goals.

An analysis has also been made of the cost and planned investment for the industrial sector. We used a cost model and data from the Census of Manufacturing 1968. In this evaluation, we found the total capital required to meet the water quality standards for industry by 1976 was found to be 8.1 billion, however, but it could go as high as 12.2 billion The variation takes into account the efficiency of industry in dealing with their pollution problems. · We found definite trends in terms of water productivity and water efficiency in industry. Because our information on industrial expenditures in pollution control is not that good, i.e., we do not have a survey of industrial expenditures, nor do we have a complete industrial data base, we took these trends into consideration and provided a range of 8 to 12 billion.

These expenditures are broken down for you in the handouts in Table 1. Furthermore, on this Table you can see the variations between industrial sectors. The food and kindred products which is rather prevalent in California, the paper and allied products and primary metals are clearly going to be required to expend more money than the other areas.

Aside from the capital expenditures, it was found in the industrial sector that approximately 20 billion dollars would have to be spent during the time periods 1968 through 1976. And the reason they're for that period is that our data base went from 1968 to 1976. I have made adjustments to bring this up to 1972, and the expenditures would be approximately 16 billion during the 1972-76 period.

Before completing the presentation of the costs that we feel that are going to be required to meet the first Phase of these particular bills, I'd like to make a few comments that might help to answer some of the questions later on. The respective bills call for 14 billion dollars in the Senate for municipal treatment, and 20 billion dollars for municipal expenditures in the House version. Added to the 14 and 20 billion are monies for reimbursable commitments.

Another objective of EPA in assessing water expenditures is the whole question of cost effectiveness. It is our feeling that the numbers we presented are possibly the outside costs and that if we use cost effective criteria, we could possibly lower the costs. The achievement of the goal at lower cost depends on the trends in manufacturing water use and on the cost effectiveness of municipal construction activities.

A number of economic and institutional changes in the last decade have led to the expectation that incentives have been provided for industry to curtail its treatment of liquid waste. These incentives have producted behavior on the part of industry. We do see that they're curtailing their waste producing activity and see definite trends in better water use. Furthermore, the scarcity of water itself as a resource is also producing trends in industrial activity. This trend is witnessed in the amount of recycling of waste today by industry.

In recycling of water, what happens is that we have a concentration of waste in which the industrial waste water is discharged. Given the concentration in wastes it becomes easier and also less costly to treat the industrial waste. There's less volume. Furthermore, there's a greater chance of by-product recovery. Some facts that bear out this trend are that during the 1959 to 1968 time period, the Federal Reserve Board index of industrial production for manufacturing increased 59 percent. During the same time period, the increase on water use was 24 percent, this difference indicates either one of two things happened: an increase in water use productivity by industry or a change in the composition of products towards less water using products. We tried to do more analysis in understanding this difference, and the Industrial Conference Board conducted a survey for us. They found that 27 percent of all capital expenditures for water pollution by industry was used for manufacturing process change to reduce water pollution and not for end of pipe treatment. That's a very helpful statistic in terms of understanding how industry is responding to pollution today. It implies that a lower cost in achieving water quality standards does depend upon the industrial response to the problem.

There are several factors that I'd like to discuss with you that might be helpful in either altering industry's response, or better understanding industry's response to the waste handling problem. The first is that alternative approaches to waste reduction can produce similar efficiencies within a wide range of costs. The 8 billion to 12 billion dollar comparison demonstrates that point. Therefore, we're encouraging a policy of flexibility in approach to the issue. One of the things that we're trying to encourage in our regulatory policies is to avoid specifying particular types of treatment. Rather, we establish limitations that we want industry to meet, and it's up to industry to find the least cost method of getting down to that level.

Another thing that economists are traditionally looking at is the utilization of financial incentives either through user charges or effluent fees. It's a very powerful avenue for encouraging industry to respond to reducing their waste problems. I won't go into the pros or cons of an effluent fee or user charge mechanism at this time, but as economists, we're trying to look at alternative ways where incentives can be created so that industry will modify their behavior.

In the municipal sector, the way that we alter behavior is through subsidization or through construction grants. Up to now, EPA has supported a categorical grant program specifying that certain facilities can be constructed and other facilities can't. Under the new legislation, the categories of eligibility are broadened. Collection systems would be eligible for grants as well as combined storm sewers.

To obtain a least cost and cost effective solution in the municipal area, requires that we plan and that we use these grants effectively. Care must be given such that we don't promote activities that aren't need, i.e., promote sewering and over design of facilities. We're beginning to find in our sewering trends that there is an emphasis toward sewering everybody. Our analysis demonstrates to the point that the assimilate capacity of soild is not exceeded, the use of ground disposal could be a viable alternative for treatment. If we don't contaminate the ground, there's no reason why we have to connect septic tanks to sewage systems. However, at that point in time where health conditions are violated, or where it's found that ground water cannot assimilate the wastes, then it should be transported to a liquid waste system. This in our municipal systems we face the planning challenge of finding out which media can best handle our wastes, water or land. We're trying not to develop a closed mind concerning these alternatives, but to really broaden our planning horizons by considering alternatives.

Concerning the design of plants, this is an area where up to 80 percent of the expenditures are coming from, or could come from Federal and State grants to the local communities. I think we have to be very careful not to design excess or idle capacity. The money that we spend in idle capacity could be used elsewhere for more productive pollution control measures. Furthermore, when we design excess or idle capacity, we subject municipalities to financial penalties, higher operation and maintenance costs and higher interest payments for capacity that they're not using. In last year's report, the Cost Effectiveness of Clean Water we estimated that the penalties for municipalities due to increased interest rates and for higher operation and maintenance was approximately 37 million dollars.

Finally, when we look at the cost effective solution for a municipality, we don't want to look just at the treatment alternatives. Rather, we want to look at the total system. It was mentioned at our luncheon today that we've got to start considering total systems approaches to the problem. Well, one of the things that we are encouraging is considerations of alternatives, e.g., alternative methods of treatment such as land disposal. We now have a project in Muskegon County in Michigan for land disposal projects. This project is a series of conventional primary and secondary treatment with spray irrigation for higher levels of treatment.

Also, we need to look at such phenomenon as conservation of water. This is a particularly acute problem today in Los Angeles, and one of the things that our research efforts are now doing, and the new legislation requires us to go further, is to find out different ways through which we can conserve water. This includes different household facilities, different ways of conserving rain water, etc. Our approach is one of looking at long-run trends and the overall long-run plan, and not just concentrate on immediate stop-gap procedures, such as a treatment plant here or an add-on there.

We are trying to encourage a total environmental system purview.

In sum, I'd like to say that the foregoing analysis was useful in the legislative process with regard to helping us establish the level of treatment costs that could be supported. As I mentioned before, that basic level is equivalent to secondary treatment or best practical technology as a base level, and where needed, higher levels of treatment. However, we opposed a blanket high level of treatment, and the effort to go to zero discharge now as an operational policy. Rather, we felt that as we went to higher levels of treatment we should in fact balance these higher level costs with benefits that will be derived.

Furthermore, we've also supported the idea of water quality standards. In the Senate version of the bill, we find that the water quality standards are not retained as an operational tool, in the House version, they are retained. And in our application effluent limitations, which embody the definitions of "best practical technology: and "best available technology" we want to be able to tailor those effluents to the ambient water quality criteria.

In the past, we might not have been successful in these efforts, but we're hoping through the planning requirements of the new legislation both basin and on a metropolitan area that we will be able to make the linkage between effluents and ambient conditions.

Through such an approach, we hope that the number of stream miles in future reports will not be 27 or 29 percent, but will be substantially lowered. Furthermore, we will be able to lower these percentages of stream mile polluted in the most cost effective manner possible.

Thank you.

MR. CARROLL: All right, Mark. I'll see how much you really know about water.

A mechanical question here, referring to Table 6, Column No. 1, Percentage of U. S. Miles Polluted for reasons 1 through 10 adds up to 293 percent. It appears the heading needs to be corrected. What should the headings be? Please explain what they mean. For example, how is duration intensity defined?

MR. DE FALCO: That question may have come in before you commented on that, but you want to check the heading?

MR. PISANO: The person is a good editor. It actually should be percentage of miles polluted in that particular region. For instance -- let's take San Francisco, 23.5 percent of the stream miles or waterways in this particular region are polluted.

Concerning the duration and intensity factors the way we've defined those are as follows: If pollution occurs in four quarters, then we have a weight of one to four, and those were considered and summed. That's the duration factor. The intensity factor -- if pollution was not very bad, etc., it was given a weight of 1. If it was extremely bad, it was given a weight of 10.

There's a certain amount of subjectivity in developing this index. We asked our regional people to give us their best assessment in putting together these duration and intensity factors. I'd like to point out that we did have a very large data base in helping them to develop these subjective factors. We do have measurements of when standards are violated, and these are taken throughout the year. However, a standard violation is a standard violation and the intensity factor, we find, is one of the more difficult ones to put a rating on. In other words, how bad is bad?

Here, again, that's a highly subjective matter.

MR. CARROLL: Mark, I have quite a few questions for you here and the range is very good, so let's try to see if we can't go through them kind of quickly in the hope people will indulge us and think we aren't being arbitrary here.

Do you feel that base level secondary treatment, 80 to 95 percent removal will meet cost benefit tests for deep ocean disposal as now used?

MR. PISANO: Well, the two are rather separate. The 80 to 95 percent is for treatment removal, whereas, ocean dumping is the actual dumping of wastes into the ocean, e.g., sludges into the ocean. EPA actually has an ocean disposal policy and this policy will be strengthened in the new legislation. This policy requires permits justifying that we aren't impairing the ocean, and aren't altering the biological life in the ocean, etc.

MR. CARROLL: Costs of clean water invariably revolve around treatment of sewage and industrial wastes. The case of estuarine and costal waters, surface runoff of urban and agricultural areas, appears to be of significance, yet there is little Federal action. Why not?

MR. PISANO: On that particular point, coastal areas within the contiguous zone and estuarine areas are considered in our municipal and industrial regulatory activities. So, to that extent, I would have to defend our current posture as saying that we are concerned with these, and we are dealing with them. Where I won't defend our policies is in the area of non-point source pollution control. We don't have completely adequate programs in this area.

So, to that extent, where these problems are occurring, we might not have fully developed programs. But that's not to say we're not interested. We are looking into the questions such as agricultural, mining and other pollution sources. We have fully developed research programs in those areas and the new legislation requires us to in fact develop operating programs in this area. I didn't mean to say that we aren't looking at non-point problems, but in the past, they haven't been taken into full consideration.

MR. CARROLL: Why does EPA continue to promulgate blanket standards for water and air without regard to regional implications?

MR. PISANO: I think that was the point of my talk -- that in the water area, EPA is supporting the policy of water quality standards that vary according to river mile. If you go through the water quality standards for any particular river, you'll notice that the DO levels vary, the temperature levels vary, and it's this policy that we want to be able to continue. We want to be able to ascertain what is the level of pollution or the level of pollution elimination that we want, which could vary according to the rather heterogenous water masses that we're dealing with.

MR. CARROLL: In the case of air,

MR. PISANO: We set ambient national levels, but it's the states themselves that are covering the 248 air quality control regions. They are submitting their own implementation strategies.

MR. CARROLL: On what basis, Mark, is EPA requiring local agencies to discontinue the discharge of sludge to the ocean?

MR. PISANO: I think I answered that earlier, through a permit program for ocean dumping.

MR. CARROLL: Do we now have available standards and regulations upon which cost effectiveness and preparation of plans for industries to make these installations and new construction, guidance to obtain permits?

MR. PISANO: The basic guidelines for the industrial sector will be effluent guidelines which will stipulate the levels of residuals per unit of product that will be permitted to be discharged. How industry achieves this, we hope, as I mentioned before, they'll do it in the most cost effective way possible. We don't have a guideline for the design of industrial treatment facilities.

Now, on the municipal side, we do have guidelines for cost effectiveness. We're very concerned with this area, and the reason we're concerned is because of the large portion of Federal and State monies that will be going to local communities. Therefore, we are promulgating cost effectiveness guidelines that would try to produce some of the objectives that I talked about this afternoon.

MR. CARROLL: One major deterent in meeting 1976 clean water goals is the emerging tendency for EPA to make environmental impact statements required on waste water treatment projects.

What is EPA's current position in making environmental impact statements on all clean water projects? I assume the distinction is between municipal and industrial.

MR. PISANO: That is correct. In the industrial area -- let me handle that first -- the basic regulatory mechanism that we're using is the permit program. We've asked Congress -- and in the House version of the bill, there's an Amendment -- to exempt environmental impact statements for permit applications. The reason being that the permit itself can be considered as a form of an environmental impact statement, i.e., taking into consideration those factors that an environmental impact statement would. Because of the Kalur Decision we have asked for an exemption of the EIS on the permit so that we can proceed as rapidly as possible in granting permits and in imposing regulations on industry.

Now then in the municipal area, the number of plans, etc, are not large. There aren't that many municipal facilities that will require impact statements. Furthermore, I think it would be a help in our whole planning process to have the environmental impact statement, and we're trying to develop procedures where, in fact, we can promulgate these as quickly as possible.

MR. CARROLL: In your talk Mark, did you define the best practicable technology in the secondary treatment?

MR. PISANO: The definition of best practical and secondary treatment stated that secondary treatment basically applies to municipal systems. It's a term that sanitary engineers have used traditionally for the high level of treatment, 85 to 95 percent removal.

Now, in the industrial area, we have a more difficult time defining an equivalent of secondary treatment. There's such a heterogenity of processes and precedures whereby industry can remove wastes that we found that the term secondary treatment didn't have very much meaning. So we conined a word (sic) called "best practical treatment," which means the level of treatment activities that are used for residual removal.

In some industries, the best practical treatment is equivalent to tertiary treatment in the municipal sector. However, in other areas the best practical treatment might not be as high as secondary treatment, so what we're saying is that level of technology which is being used today.

MR. CARROLL: What is current and probable final policy on municipal grant funds for reimburseable construction projects without Federal grant offer?

And I assume the reference is to the 1972 fiscal year projects that have been held up. If the Feds renege, how will this credibility gap affect promises to industry?

MR. PISANO: Let me answer that second question first. EPA doesn't make any promises to industry. EPA is a regulatory industry, and I think that Bill Ruckelshaus clearly laid out our regulatory policy toward industry. The only promise that we want is from an industry to get to what we hope are reasonable regulations on a level of reductions.

Concerning the first question, EPA carries out legislative mandates and charters. We initially had a provision for reimburseables in the Public Law 84660. When that law expired, the reimburseable provision also expired, and our extensions to that bill did not provide for full payment of reimburseable projects. However, the pending legislation, both the House and Senate do contain provisions that will allow EPA to honor those commitments made for reimbursables.

MR. CARROLL: You mentioned the allocation formula based upon needs. To establish this need, you are using nationally applicable formula. I fear from what you said that California's tax money will not be used to help maintain good water quality in California, but rather to clean up dirty rivers elsewhere that the people there should have done themselves. Will California be sacrificing for the rest of the nation?

MR. PISANO: That's a good question. We do have a national program, and the national program requires us to address the problem nationally. I'll answer this in a rather circuitous way and then I'll answer it directly.

In a certain sense, there are benefits to the people in California for clean water throughout the nation. The residents of California recreate elsewhere, not just in the waters of California. Therefore, there is a reason why we have a national program. These are, as economists call them, externalities, that is, benefits that accrue elsewhere that might affect the person in that particular state. I happen to put a name on that called spacial externalities. Thus to a certain extent, there is some rationalization for spending money collected in one state for problems elsewhere.

Now, in a more direct way of answering that question: The State of California has a lot of facilities that they've built and that are wearing out and depreciating. And to a certain extent, the recapitalization of these investments probably will constitute a large portion of California's needs.

So that when we really balance off on a population basis and on a need basis because of the investment activities in this state, I don't find a great disparity in tax dollar expenditures.

Furthermore, I think that in previous years when the State of California had a more accelerated program than other states, tax dollars from those states went to California.

MR. CARROLL: Do the high quality levels achieved by the Lake Tahoe Project cost as dearly for the final purification as shown on your Table 9? If not, what is the difference? I assume you aren't that unfamiliar with Lake Tahoe.

MR. PISANO: Lake Tahoe uses a lime calcification process for phosphorus removal, which removes up to 99 percent. In establishing the cost function that we've put together in Figure 2, lime calcification is one of the forms of tertiary treatment in the 95 to 99 percent removal. It's not the most expensive of those processes, but it was considered in developing this cost function.

Other higher cost solutions in the tertiary treatment level would be on exchange or carbon adsorption, which is not being implemented in Lake Tahoe.

MR. CARROLL: All right, I saved one of your favorites for the last Mark.

As an alternative to ocean disposal, what particular problems are inherent in land disposal of domestic and industrial sewage sludge with regards to nitrates concentration and ground water contamination? Isn't it probable that this alternative of land disposal could be more detrimental to the overall ecological balance than ocean disposal?

MR. PISANO: On that particular point, nitrate contamination and saturation is one of the questions in the whole land disposal alternative. And nitrate absorption in the soils depends upon the amount of humus and the absorptive capabilities of the soils. It is true that through growing of crops, etc., much of the nitrates can be absorbed. I'm not technically familiar with this process, but it is my understanding that through these cropping activities the nitrates can be absorbed, the crops harvested and the nitrates taken elsewhere.

If cropping activities are not present, there could be nitrogen contamination, and this nitrogen contamination in ground waters could be far more harmful than the element that we're trying to circumvent in general discharge into water.

And in our design of land disposal facilities -- or in our consideration of this alternative, this question of nitrate contamination is one of the factors that we place high importance on investigating.

MR. CARROLL: Now, I have just a couple of general questions here that I didn't know to whom I should assign, so before Paul closes, I'll just try to respond to them.

When we figure benefits against costs, what benefits are we calculating and to whom and how do benefits to future generations figure in our calculations?

Well, we only started for the five years out. That's as far as we've been able to get so far this year.

What rules or guidelines exist to assist the person responsible for environmental impact statement preparation?

Each major agency has its own guidelines which have been prepared under guidelines in turn promulgated Government-wise by the Council of Environmental Quality. Those guidelines for each agency would indicate how they are to be prepared, by whom and at what stage in the process. If you are dealing with any particular agency, I would suggest you consult with that agency.

What kind of technical, professional or financial aid can EPA provide to municipalities and their attempts at local environmental protection?

This is mainly in the air area and in the water area, I would assume. In the case of air, EPA does support municipalities and the states by what we can a control agency grant. In the case of water, we support the State programs. We provide technical assistance to both municipalities and states, and we provide manpower -- I think this year we have 150 people working in the states on the air implementation plans, and that's scheduled to go up to 300 people next year.

Are there any epidemiological data to support recreational water quality standards? Are there any plans to implement beach studies as was done by the Public Health Service in the 1950's? Are there any plans or studies to support consistent recreational water quality standards on a national level?

I believe we're in the midst of a National Academy of Science Study which will update the PHS study of the 15th. Paul is a little more familiar with it than I. He tells me it's about in draft stage, therefore, we would hope to have it out fairly soon.

How large is the total staff of EPA? And the staff for analysis, planning and implementation?

EPA has a staff in the fiscal year '72 with a year-end target of 8,000. Next year, it'll be 8500. In the planning and evaluation shop, there are about 35 to 38 professionals and some secretarial support.

Has EPA taken a stand pro or con concerning the pollution initiative on the June 6 election?

We received a number of questions that relate to the strictly local matters, the regulations that the various boards should or should not adopt here in Los Angeles as to our position on the initiative. I decline answering those since we feel that those are purely local matters. We do not wish to impose, even if we could, our authority on your choice here as local citizens.

I want to -- first, to congratulate you who have survived this long day. If there is this sort of interest in California in these matters, it's really an awfully good sign that you can put up with all this.

In the interest of fairness, I want to close with just one question here that, when we get all through with our speechifying and even from extemporizing up here, gives food for thought.

Summing up: A simplistic appraisal? If what is workable is that which business will accept; if a consultant is recruited from the industry involved; if no administrative agency can exceed the will of its sponsor; if political parties and leaders cannot divorce themselves from dependence upon private financing; if industry will jeopardize whatever competitive position it might have; if economic growth and resource utilization is not radically reduced; and if citizens cannot sue for pollution damages; how valid is the assumption that we can begin to get ourselves in order by 1976?

I thank you. Paul.

MR. DE FALCO: Just one closing announcement. All who registered will receive a copy of the proceeding. I hope we can transcribe and have them reproduced within the next six weeks. It will be a tall order.

I would like to indicate that we've convened this meeting in keeping with Mr. Ruckelshaus's principle that the workings and the decisions of the Agency be fully reported to the public. We have attempted to do that today.

Thank you for coming.

(Meeting adjourned)

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